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MOTIVATIONAL FACTORS RELATED TO THE ADOPTION OF IMPROVED FARM
PRACTICES: A STUDY OF THE SORGHUM PROGRAM OF THE
KANO STATE PILOT PHASE OF THE NIGERIAN
ACCELERATED FOOD PRODUCTION PROJECT

by

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Chapter I

INTRODUCTION

The crucial role of agriculture in the development of low income countries, such as Nigeria, is generally accepted. Meir (1976) recalls that the recognition of the role of agriculture in the development process dates back at least to Ricardo, who predicted that the upper limit to the growth of the non-farm sector would be determined by a limitation in the growth of agricultural output.¹ Many contemporary economists believe that agricultural development is necessary, if not a pre-condition for economic development.²

The concept of balanced growth would imply that, for many low income countries, the firm path to economic development lies in concurrently developing a modern sector and in transforming the traditional sector into a viable, dynamic agricultural system. In recent years, the concept of integrated use of high pay-off inputs, support services and infrastructures has become popular. Several "green revolution" countries, notably Mexico, India and the Philippines have made

¹Meir, G.M. Leading Issues in Development Economics. Oxford University Press, New York (1976), page 563.

²The usage of "growth" and "development" in this context is not intended to imply that the two processes are synonymous. Development, of course, is "growth plus change" and it is realized that there can be "growth without development".

considerable progress in agricultural development. In 1972 the Nigerian government instituted a study to determine how the "green revolution" concept could be used "to stimulate the masses of small Nigerian farmers to dramatically" increase food production. Sprague et al. (1972) recommends an "integrated research, extension and training program" involving the use of improved agronomic practices, high yielding seeds, adequate fertilization, insecticides and other agricultural chemicals, supporting credit, marketing, storage and processing intra-structures, as a means of achieving the "green revolution".³ The recommended program was initiated at the pilot level in four States in 1973: Kano State for the sorghum, millet and wheat programs, East Central State for the casava program, Benue Plateau State for swamp rice program, and Western State for the upland (dryland) rice and maize programs.⁴

A New Strategy for Increasing Agricultural Productivity:
The NAFPP

The primary objective of the National Accelerated Food Production Project (NAFPP) is to make Nigeria self-sufficient

³Federal Department of Agriculture (FDA), Lagos, Nigeria, National Accelerated Food Production Project (NAFPP) Newsletter, Vol. 1, Number 7, Sept., 1976.

⁴Several new States have been created in Nigeria since the pilot programs were initiated in 1973. The area formerly known as Western State is now made up of 3 states, East Central State, 2 states, and Benue Plateau, 2 states.

in the major staples and to raise farm income. It is a multi-dimensional program aiming to integrate research, extension and training, credit, storage, processing and input distribution into a production system. The research component, based in the nation's research institutes, is intended to re-organize research along commodity lines or appropriate farming systems, and to conduct "location-specific" applied research with a view to evolving appropriate crop production technologies for the various ecological zones in the country. It is aimed at reducing the time lapse between the introduction of new technologies and their adoption by farmers from about eight years to approximately two or three years, by means of the "mini-kit" technique.⁵

NAFPP has the objective of increasing extension agent/farmer contact, strengthening extension training and "motivating the mass of small farmers to adopt new practices." The pilot phase of the program designed to test new concepts, provide management experience and prepare the operational plan for the nation-wide production phase has recently ended. The Project was executed jointly by Federal Department of Agriculture (FDA), national crop research institutes and States' Ministries of Agriculture and Natural Resources (MANR). The extension component is an integral part of the agricultural extension program of States' MANR.

⁵International Institute of Tropical Agriculture, Ibadan, Nigeria; The NAFPP: A New Dimension for Nigerian Agriculture (1977), page 13.

Inducing Change in Nigerian Agriculture: A Conceptual Framework

The decision to accept or reject agricultural innovations is the individual farmer's responsibility. Farmers' motivation to change is of fundamental importance in the success of programs of agricultural modernization. A major problem implied in modernizing Nigerian agriculture is the reluctance of small scale farmers to adopt improved agricultural technologies. Nonetheless, empirical field studies of the factors underlying the resistance to innovation acceptance have been lacking, in spite of the obvious usefulness of such information to the modernization process. To develop an appropriate strategy for modernizing small-holder agriculture, it is necessary to have a clear understanding of the human factor, those forces that enhance or inhibit the adoption of improved technologies. The present study was intended to provide information on the factors that enhance the motivation of small scale farmers to adopt improved agricultural practices. A conceptual framework was developed based on Maslow's (1970) growth theory of motivation and McGregor's (1957) "Theory Y" (both theories are described in detail in Chapter II): (1) small scale farmers have potential for growth; (2) they are not, by their nature resistant to change per se; (3) if they appear unresponsive to agricultural innovations and technologies designed to improve productivity and raise levels of living, it is because of the social, economic and physical environment in which they operate; (4) the primary role of extension organizations and personnel is to help them actualize their potentials

and find fulfillment in their lives; and (5) to be effective in that role, extension organizations must address the situational factors that enhance or inhibit clientele motivation. This conceptual framework formed the basis for undertaking the present study on the sorghum (guinea corn is the popular name in Nigeria) program of the NAFPP in Kano State. Sorghum is by far the most important staple cereal crop grown in Nigeria (Oyenuga, 1967).⁶

Objectives of the Study

The primary objective of the study was to investigate these factors which enhance the motivation of farmers in Kano State to adopt improved practices for sorghum production.

The specific objectives were: (1) to determine the personal characteristics of sorghum producing farmers in Kano State; (2) to determine the effects, if any, of these characteristics on the adoption of agricultural innovations: age, literacy, farming experience, size of household, family/work organization, size of farm, off-farm occupation, leadership positions; (3) to measure the effects of these factors on the adoption of agricultural innovations: (i) extension input, including contact of extension agents with farmers, guinea corn extension demonstration plots, guinea corn "mini-kit" plots, and guinea corn "production kit plots; (ii) production inputs:

⁶Oyenuga, V.A. Agriculture in Nigeria, An Introduction.
FAO, Rome, 1967, page 176.

fertilizer, improved seed, credit, labor; (iii) farm mechanization: tractor hire and ox-plow use; (4) to identify those factors presumed to affect farmer motivation; (5) to seek an understanding of farmers' perceptions of improved guinea corn production practices in terms of economic profitability, technical feasibility, social acceptability, compatibility with their farming system, and relevance to their felt needs; and (6) to make suggestions on how to improve the relevance of improved technologies and to heighten farmers' motivation to adopt agricultural innovations.

An understanding of farmer motivation can aid extension administrators to formulate policies, plan programs and adopt extension methods more appropriate to local needs. A sound understanding of farmer motivation will enhance the effectiveness of extension agents in inducing farmers to adopt improved agricultural practices. Williams (1967) recommends that extension agents in Nigeria should receive training in the theory of motivation.⁷ Boggs (1976) points out that although motivation is intrinsic to the individual, it can be strengthened, augmented or diminished, using external sources.⁸ Dichter (1972) dramatized the importance of motivation when he wrote: "Changing human behavior without understanding

⁷Williams, S.K.T. Identification of Training Needs of Extension Workers in Western Nigeria as a Basis for Developing a College Training Curriculum, Unpublished Doctors Dissertation, Cornell University, 1967.

⁸Boggs, D.L. "m=f(g+s) or Motivation Equals a Function of Growth Plus Safety", Journal of Cooperative Extension, March/April, 1976.

motivations is like trying to start a stalled car by kicking it".⁹

Some people are of the view that farmers' pride and status symbols are more important motivational factors than economic considerations in Nigeria.¹⁰ On the other hand, empirical studies from some parts of the country support the view that small scale farmer makes rational economic decisions in his farm enterprise and that profit maximization and security considerations are the driving forces behind his decisions.¹¹ It is important that empirical studies of an applied nature be made in Nigeria to elicit those factors that motivate farmers to change from the less productive, traditional ways of farming to scientific, yield-increasing innovations.

Assumptions

The usefulness of the findings and conclusions of this study rest on some assumptions:

1. That interviewers were capable of correctly conveying the meaning of the questions to subjects and accurately recording subjects' responses.
2. That subjects expressed their true feelings and

⁹Dichter, E. Motivating Human Behavior, MacGraw Hill Book Company, New York (1971). Page 79.

¹⁰Personal communication with L.B. Williams, NAFPP Planning Economist, IITA, Ibadan, Nigeria. July 12, 1976.

¹¹Norman, D.W. An Economic Survey of Three Villages in Zaria Province. II. Input-Output Study, Vol. 1, Publ. Institute for Agricultural Research, Samaru, Zaria, Nigeria (1972), pages 71-79.

facts as known to them and that these feelings and facts are shared by the preponderance of the population.

3. That the needs of respondents do not differ from the needs of small scale farmers in northern Nigeria.

4. That appropriate technology for the production of guinea corn is available and being extended to farmers.

5. That agricultural extension techniques currently being used are appropriate to the needs of the Kano farmer.

6. That the information obtained in this study can be used in practical terms by extension organizations and personnel to enhance farmer motivation to adopt agricultural innovations.

The basis of these assumptions and the steps taken to safeguard them are discussed in Chapter II - "Methodology".

Hypotheses

Three null hypotheses were developed for testing:

1. There is no relationship between the personal characteristics of Kano farmers and the adoption of improved guinea corn production practices.

2. There is no relationship between extension agent/farmer contact and the adoption by farmers of recommended practices for guinea corn production.

3. NAFPP field programs have not enhanced farmers' motivation to adopt recommended guinea corn production practices.

Background

In the preceeding sections, the relevance of the present study to Nigerian agricultural development was discussed. In this section background information on Nigerian agriculture, research and extension institutions and the physical and social environment of the guinea corn farmer, pertinent to a fuller understanding of the study, is presented.

The role of agriculture in Nigeria's development. The Federal Republic of Nigeria, a federation of nineteen states, occupies an area of 941,849 square kilometers between latitude 4° and 14°N in the West Africa sub-region. According to the 1963 census, the country had a population of 55.6 million, projected to rise to approximately 75, 87, and 100 million by 1975, 1980, and 1985, respectively. National population density in 1963 was 60 persons per square kilometer, projected to rise to 94 and 109, respectively, by 1980 and 1985. Kano State is one of the most densely populated states in the country. It had a population density of 127 persons per square kilometer in 1963, projected to rise to 210 and 243 by 1980 and 1985, respectively.¹²

(1) Capital formation and employment opportunities. Agriculture,

¹²Federal Ministry of Agriculture and Natural Resources, Joint Planning Committee, Lagos; Agricultural Development in Nigeria 1973-1985; Caxton Press (West Africa) Ltd., Ibadan, Nigeria (1974), pages 309-316.

the most important sector of the Nigerian economy, employs about 70 percent of the labor force.¹³ The place of agriculture in the economy could be assessed from its share contribution to the total goods and services produced in the country, i.e., the gross domestic product (GDP). In 1970, primary products (agriculture, livestock, fisheries and forestry) contributed 51.3 percent (N 3,483.8 million (see page 25 for conversion to U.S. dollars)) to the GDP.¹⁴ Per capita income is about N 205. Farm income is substantially lower at N 175. During the 1961-70 decade, agricultural exports accounted for a mean annual contribution of 62.2 percent to all exports. Helleiner (1966) provides an in-depth account of the role that small holder agriculture has played in Nigeria's economic development.¹⁵

In recent years, petroleum mining has assumed the leading role in capital formation. By the 1973-74 financial year, the share contribution of agriculture to the GDP had declined to 24.7 percent. Central Bank of Nigeria (1972), however, warns

¹³In, Nigeria: Contribution of Agriculture to Export and Import Trade, 1972 (mimeo, page i, Federal Department of Agriculture (FDA) Planning Division asserts that the overall percentage of the labor force estimated by the census report to be employed in the Agricultural Sector was "60 (not 70 percent)". Several sources appear to suggest that 60 percent is on the low side, for instance, FMANR Joint Planning Committee (1974) estimates it at "70 to 80 percent".

¹⁴FMANR, Joint Planning Committee, Ibid., page 54.

¹⁵Helleiner, G.K. Peasant Agriculture, Government and Economic Growth in Nigeria. R.D. Irwin, Inc., Homewood, Ill. (1966).

of possible exhaustion of the nation's petroleum resources and a subsequent return to agriculture as the source of foreign exchange earnings.¹⁶ Tims (1974) points out that petroleum is unlikely to generate enough capital to meet the needs of the Nigerian population for actual petroleum revenue in 1970 was only U.S. \$4 per capita. Projected petroleum revenue for 1975 was only U.S. \$25 per capita.¹⁷ Current petroleum revenue is approximately N 6,000 million per annum which amounts to 84 percent of the nation's total revenue receipts and 93 percent of the total foreign exchange earnings. Even so, current petroleum revenue per capita amounts to only about U.S. \$113 (approximately N 75). This compares to other Organization of Petroleum Exporting countries (O.P.E.C.) such as Saudi Arabia, Iran and Kuwait where per capita petroleum revenue is 4,500, 660, and 8,500 dollars per capita, respectively. It is feared that unless new discoveries are made present levels of production could deplete the known reserve in 15 years.¹⁸ Nigeria's large population base principally accounts for the relatively low per capita petroleum revenue as the country is the world's sixth

¹⁶West Africa Magazine, Number 2856; March 10, 1972. Page 270, quoting a spokesman for the Central Bank of Nigeria.

¹⁷Tims, W. Nigeria: Options for Long Term Development, The John Hopkins University Press, Baltimore and London, 1974, page 76.

¹⁸Buhari, M. (Colonel). Commissioner for Petroleum Resources and Chairman, Nigerian National Oil Corporation, in a press briefing, "New Nigeria", No. 3634, Saturday, October 15, 1977.

largest exporter of crude petroleum.

The creation of employment opportunities is an important welfare objective of development. Norman (1973) estimates that it will require a minimum of 24 percent annual increase in non-agricultural job opportunities to absorb the expected increase in Nigeria's population.¹⁹ In addition to the primary role of providing food for a rapidly increasing population, agriculture will remain the largest employer of labor in Nigeria in the foreseeable future.

(2) Population growth and food supplies: a precarious balance.

The most fundamental role of agriculture is providing the food and fiber needs of a nation. Sometimes underestimated, this function has implications for economic development and political stability.

Traditionally, Nigeria has been self-sufficient in staple food supplies. In recent years, shortages of food supplies, in combination with rising costs, have been observed. It is sometimes argued that the situation does not reflect an absolute decline in food production, or the failure of the agricultural system to meet the food needs of the country. Rather, it is the result of an inefficient marketing system being exploited by the middle men in the marketing chain between urban consumers and the farm gate to create artificial

¹⁹Norman, D.W. Employment as a Development Objective in Nigeria: What about the small farmer? Paper prepared for the Ahmadu Bello University Public Lecture, February 13, 1973.

scarcities and increase prices.²⁰ Hays' (1975) found from a study of the Marketing and Storage of food grains in Northern Nigeria "that the traditional market structure is basically competitive and leaves little room for exploitative practices"; and that "incomes of marketing intermediaries were low relative to their services, there being no evidence that they were able to exploit inefficiencies in the traditional market structure to increase their share of the final retail price. He found that "farmers received on the average 69 percent of the retail price of grain" ²¹ It appears, therefore, that the elimination of middle men or improvements in storage, distribution and marketing would alleviate only a part of the problem.

A more fundamental reason for the short fall in supplies appears to be the growing disparity between the rates of growth of food production and population. The food production growth rate, estimated at 2.5 percent per annum, trails population growth rate, estimated at 3.0 percent per annum. To sustain per capita food consumption would require that food production must rise at least 3.0 percent, hence the implications of the lower rate of growth of food production vis-a-vis population. In practice a higher level of growth would be needed to offset the unpredictable effects of pest damages to crops, bad weather,

²⁰A similar reasoning is implied in FMANR, Joint Planning Committee, Ibid., pages 82 and 83.

²¹Hays, H.M. Jr., The Marketing and Storage of Food Grains in Northern Nigeria, Samaru Miscellaneous Paper No. 50, Publ. Institute for Agricultural Research, Samaru, Ahmadu Bello University, Zaria (1975), page 90.

wastages as well as food stuff movements across the nation's frontiers and increases in incomes of consumers.

Olayide et al. (1972) reviews the food situation in the country and warns that "many lean years" lie ahead of the nation. Their projections revealed short falls in the supply of major staples as early as the 1975 target year which were expected to continue for the period up to 1985. Only rice was expected to register "positive surplus".²² A shortage of approximately 1.9 million tons of sorghum is anticipated by 1980.²³

(3) Low productive efficiency. Nigeria's small holder agriculture has low efficiency in terms of crop yields. There is a considerable gap in the yields obtainable using research-proven agricultural innovations and the yields obtained by small scale farmers using traditional practices of crop husbandry. A study reported by FMANR, Joint Planning Committee (1974), expressed crop yields in each State of the Federation as a percentage of the potential yield to obtain the coefficient of crop production efficiency. It was found that for most crops, most States were in the D, E, and F categories in a classification system where A, B, C, D, E, and F represent yields greater than 90 percent, 70 to 90 percent, 50 to 69

²²Olayide, S.O., Dupe Clatunbosun, E.O. Idusogie, and J.D. Abiagom. A Quantitative Analysis of Food Requirements, Supplies and Demands in Nigeria, 1968-1985. Publ. Federal Department of Agriculture, Lagos, Nigeria (1972), page 65.

²³FMANR, Joint Planning Committee, Ibid., page 339.

percent, 30 to 49 percent, 10 to 29 percent, and less than 10 percent, respectively, of the potential.²⁴ There appears to be considerable scope for increasing agricultural output from the land presently under cultivation, assuming that improved technologies can be successfully transferred to the farm level. This assumption underlies the NAFPP strategy. Its realization depends not only on the technical feasibility of innovations but also on human factors such as motivation to adopt innovations.

Agricultural extension and research in Nigeria. According to Farguhar (1962), Cambridge University first used the term "extension education" in 1873 to describe a new program of informal education designed to take the university's educational advantages to people where they lived and worked.²⁵ The term agricultural extension in the United States was not widely adopted until the Smith-Lever Act formally established the Cooperative Extension Service in 1914. In this thesis, the terms extension, extension education and agricultural extension are used interchangeably to mean "the extending of, or a system or service which extends the educational advantages of an institution to persons unable to avail themselves of them in the normal way".

²⁴FMNAR, Joint Planning Committee, Ibid., page 89.

²⁵Farguhar, R.N. The Meaning of Extension, in Agricultural Education: A Reference Manual F.A.O., Rome, (1972).

(1) Historical perspective. The foundation for extension work in Nigeria was laid with the establishment of a station for botanical research in Lagos in 1893 and subsequent acquisition of land for cotton research and the establishment of the "Moor Plantation" station in Ibadan.²⁶ In 1912, separate departments of agriculture were set up for what was then Southern and Northern Nigeria, although the departments did not do much work until 1921. Some aspects of extension work, such as the supply of improved planting materials, must have occurred at an earlier stage for it is known that ground nuts (peanuts) and cacao (cocoa) were introduced and adopted by farmers during the early 1900's.²⁷ The 1954 regional constitution created Ministries of Agriculture in each of the regions and vested extension responsibility in the regions. Federal participation in agricultural development was peripheral at this time, being primarily limited to the affairs of Federal research institutes. The information emanating from the Federal research institutes was channelled to farmers through the Regional Ministries of Agriculture.

Early extension work was mainly regulatory, but by 1954, the extension services had assumed more educational and service-oriented roles. In the Northern Region, extension work was

²⁶FMNAR Joint Planning Committee., Ibid., page 10.

²⁷Kincaid, J.M. Jr. Strategies for the Improvement of Agricultural Extension Work and Non-Degree Agricultural Training in Nigeria, CSNRD 13, 1968 (mimeo), pages 13-14.

concentrated mainly on seed multiplication, establishment of experimental farms, extension demonstration plots, soil conservation and fertilizer promotion activities. The more important village level extension work was left to Native Authority Departments of Agriculture, which had neither the trained personnel nor the funds to conduct effective extension activities.

(2) Institute for Agricultural Research, Samaru. After the establishment of the Ahmadu Bello University (ABU) in 1962, the Institute for Agricultural Research (IAR) of the northern regional MANR was transferred to the University. The Extension Research Liason Service (ERLS) was similarly transferred. This arrangement is of interest for it brings into a central point university teaching, research and extension. This is a departure from the "standard British model" of extension education described by Axinn and Thorat (1972).²⁸ ERLS translates research findings into a form more usable by extension personnel and farmers, takes research findings to the Ministry, and brings back to researchers feedback on the performance of new technologies as well as farmers' problems.

(3) Improved technology. Improved agricultural technology used by farmers in the Northern States originates mainly from IAR, located at Samaru, 160 kilometers south of Kano. IAR has

²⁸Axinn, G.H. and S. Thorat. Modernizing World Agriculture: A Comparative Study of Agricultural Extension Systems. Praeger Publishers, New York, Washington, London (1972), page 11.

responsibility for research on sorghum and other major crops grown throughout the Northern States. The National Cereals Research Institute located at Ibadan has primary responsibility for rice, maize, and the pulses. The National Root Crops Research Institute at Umudike has responsibility for cassava and yams. Local trials outside the research stations are conducted with the help of extension agents. A field station of I.A.R. is situated in Kano.

Improved technology for sorghum production is available and distributed through extension bulletins, posters, pamphlets, etc. Regular extension radio programs are broadcast in Hausa, the main language of the Northern States. Traditionally, farmers produce sorghum grown with other crops. Economic studies have shown that intercropping is superior to monocropping, but most research has been concentrated on sorghum production practices as a monocrop. Economic evaluations of the package of practices have not kept pace with the changing prices of inputs and production, so the pay-off to the user of the technology is unknown.

(4) Kano State. In 1967, a ministry of agriculture was established in each of the six new states created out of the Northern Region earlier that year. The Kano State Ministry of Agriculture and Natural Resources was one of the six.

The Kano MANR is subdivided into five program areas: Agricultural Services Division (which is responsible for agricultural extension), Irrigation Division, Produce Inspection

Division, Veterinary Division and Forestry Division.

This arrangement separates the regulatory functions of the Ministry from the extension function. The Agricultural Services Division has a unit for agricultural mechanization and farm loans administration. The division operates three farm training centers for training the Agricultural Instructor (A.I.) cadre of extension agents, seven farm institutes for training "modern farmers", one home economics centre for training home agents and one irrigation training school. An agricultural training centre is being established as a part of the polytechnic complex to train high school graduates in various fields of agriculture.

✓ Rowat (1966) recommended an extension agent/farmer ratio of 1:1000 for northern Nigeria.²⁹ Although reliable statistics on the present ratio is lacking, it is thought to be far off the target. Agent/farmer contact is considered to be a critical factor in successful extension of improved agricultural technology in Nigeria. Actual extension work with farmers is conducted by agricultural assistants (A.A.'s) and agricultural instructors (A.I.'s). Home economics and youth extension work in Nigeria are generally not as strong as that of agricultural.

²⁹Rowat, R. Report to the Federal and Regional Governments of Nigeria On the Development of Education and Training in the Field of Agriculture Related Subjects, (Rome, F.A.O., 1965), page 17.

(5) Social and physical environment of the guinea corn farmer: land, family structure and labor organization. With an area of 43,072 square kilometers Kano State accounts for 4.4 percent of the land area and 10.4 percent of the population of Nigeria. It is regarded as a "land short" State.³⁰ There are approximately 980,000 farm families in the State. Gross agricultural production is worth approximately N 140 million.

Kano State lies in the Sudan Savanna Zone. The rainfall is light, decreasing in intensity along a south-north axis. Annual mean rainfall decreases from about 35 inches in the southern to about 20 inches in the northern part of the State. The rainy season is about four months in duration, June to September. Oyenuga (1967) describes the soil type thus: "Kano fasc - the subsoil consists of sand to clayey sand merged into red sandy clay, which may contain concretions of iron oxide. On top of the subsoil lies the loose, reddish-brown sandy top soil. The subsoil at a depth of a few feet overlies rotten granites, gneiss, or schist."³¹ The soils are well drained, and are easily worked. They have been intensively cultivated for a long time. The main crops are sorghum, millet, cowpeas, peanuts and cotton. Some wheat is grown and will assume greater importance with development of irrigation.

There are two types of family farming units among the

³⁰ FMANR, Joint Planning Committee. Ibid., page 309.

³¹ Ibid., page 51.

Hausa of northern Nigeria: the simple family unit (ivali) consisting of a married man, his wife or wives, and dependent children and the composite unit consisting of two or more adult males, their wives and children. Buntjer (1970) described the gandu as a socio-economic unit.³² Although kinship is usually involved, non-kin persons may be associated in one gandu and gandu members may be drawn from different households or compounds.

Definition of Terms

Federal Ministry of Agricultural and Rural Development.

An executive arm of the Federal Government of Nigeria having responsibility for agriculture and rural development throughout the Federation. The Ministry's schedule of responsibilities include agriculture (crop production), livestock, fisheries and forestry development as well as matters relating to natural resources research. It was formerly known as Federal Ministry of Agriculture and Natural Resources (FMANR).

Federal Department of Agriculture. A division of the Federal Ministry of Agriculture and Rural Development having specific responsibility for coordinating and providing leadership in agricultural development (crop production) throughout the Federal Republic of Nigeria. The department is responsible for overall coordination of the National Accelerated Food Production Project.

³²Buntjer, B.J. The Changing Structure of the Gandu. Samaru Miscellaneous Paper No. 180, Publ. Institute for Agricultural Research, Ahmadu Bello University, Zaria (1970).

Ministry of Agriculture and Natural Resources. An agency of a state government in Nigeria having responsibility for promoting agriculture and natural resources development within the area of its jurisdiction. It has primary responsibility for agricultural extension.

Extension Agent. Change agent, extension agent and extension worker are used interchangeably in this thesis to mean an official of a state or Federal Ministry of Agriculture and Natural Resources responsible for providing agricultural information or extending new farming ideas to farmers and schools' farm clubs. He would provide feedback to research on the new farming ideas. Agricultural assistants and agricultural instructors are village level extension workers with two years post-secondary and one year post-primary agricultural training, respectively.

Agricultural Innovation. A farming idea that is new to the potential user. Improved technology and recommended practices are used interchangeably to mean a package of research-tested agricultural innovations or practices developed to improve crop production.

Adoption of Innovations. The process which an individual passes through from first becoming aware of a new farming idea to his final use of it. Although the process exists in a continuum, it has been conveniently broken down into five stages: (1) awareness, (2) evaluation, (3) interest, (4) trial, and (5) adoption.

Discontinuance. Rejecting an innovation after it has

been adopted.

District. A collection of villages whose traditional ruler is the district head. Districts are grouped together to form a local government area.

Hamlet. A sub-division of a village, made up of a collection of households.

Tax List. A collection of names of all able-bodied adults of community tax-paying age compiled on hamlet basis for the purpose of assessing and collecting community tax.

Need. The gap between what "is" and what "ought" to be. A need recognized by an individual or community is referred to as felt need.

✓ Motivational Factors. Intrinsic or extrinsic elements having a relationship to an individual's desire for, willingness to, drive towards the adoption or rejection of a new farming idea.

Mini-kit. A package containing four to eight improved varieties (including one local variety) plus adequate quantities of fertilizer and any other input necessary for the varieties to perform to maximum. Each variety is supplied in a small quantity to plant an area of approximately 25 square feet. They are planted side-by-side on separate plots on the farmer's farm. A similar package for fertilizer observation is called fertilizer mini-kit. It contains the best performing variety from the mini-kit trial and different levels of fertilizer. The mini-kit is a research as well as an extension tool. The variety mini-kit in use in Kano State has four

varieties: three improved and one local.

Production kit. A package containing one variety (the best performing variety from the mini-kit program) plus adequate fertilizer and any other input that is necessary for the variety to perform to maximum, and appropriate instructions, to plant approximately 10,000 square feet (approximately 1/4 acre). It is the next step from the mini-kit. It serves as a demonstration as well as seed multiplication.

Extension guinea corn demonstration or extension guinea corn result demonstration. This is the conventional technique used to demonstrate improved practices of growing guinea corn in Nigeria. It is designed to contrast improved with traditional practices. Demonstration plots are often located by the roadside. The plots are established side-by-side. It is the conventional method of field demonstration in Nigeria.

Family. "Those people eating from ont pot." This is the definition used by the Nigerian Federal Office of Statistics to define a household and it implies people eating and working together. Hausa words such as gandu and ivali are underlined whenever they are used and are explained in detail in Chapter II.

Small scale farmer. A farmer with most of the following attributes: (1) produces food crops primarily for family needs even though he may produce certain crops wholly or partly for internal or export trade; (2) farm operations are not mechanized; (3) farmed acreage is relatively small; (4) resides in

the village and manages the farm personally.

Naira. A unit of Nigerian currency equivalent to about 1.53 U.S. dollars.

Agricultural Officer. This is a senior official of the Federal or a State Ministry of Agriculture, usually with college training. The functions of agricultural officers often include program planning and execution, and supervision of lower cadre personnel.

Abbreviations

FMARD. Federal Ministry of Agriculture and Rural Development.

FMANR. Federal Ministry of Agriculture and Natural Resources.

MANR. Ministry of Agriculture and Natural Resources.

FDA. Federal Department of Agriculture.

FAO. Food and Agriculture Organization of the United Nations.

GDP. Gross domestic product.

IAR. Institute for Agricultural Research, Samaru.

IITA. International Institute of Tropical Agriculture, Ibadan.

ERLS. Extension Research Liaison Service, Samaru.

NAFPP. National Accelerated Food Production Project.

AA. Agricultural Assistant.

AI. Agricultural Instructor.

n.a. Not available or not applicable.

Chapter II

REVIEW OF THE LITERATURE

Theories of Motivation. The Nature of Man: Hierarchy of Needs

The controversy over the theory of motivation that offers the most adequate explanation for, and understanding of human behavior is well-documented in psychological literature. According to Masden (1974), the problem caused by so many theories has caused psychologists to react in various ways even to the extent that a few psychologists "avoid and reject all theories". They are "anti-theoretical".¹ The prudence of being "anti-theoretical" is, of course, questionable since theories form the logical framework for hypothesis formulation and testing in science. In what he called a preface to motivation theory, Maslow (1970) discussed sixteen propositions which he asserted must be incorporated into any sound theory of motivation. A brief account of the preamble is presented because it addresses the weaknesses of earlier theories and prepares grounds for the growth theory of motivation. A good theory of motivation must account for the behavior of a whole person and of a person in relation to his social environment, because "there is no such entity as a

¹Masden, K.B. Modern Theories of Motivation: A Comparative Metascientific Study; Publ. John Wiley and Sons, New York and Toronto (1974), p. 13.

need of the stomach or mouth, or a genital need, there is only a need of the individual." Drives, goals and desires are often inter-related and as such they cannot be isolated. Isolatable drives such as hunger, on which many motivation studies have been conducted are exceptions rather than the rule. A conscious desire or motivated behavior is often a multi-dimensional channel for expressing several desires and purposes. He suggested that "the criterion on which a classification of motivational life may be based should be fundamental human goals or needs rather than the mere listing of drives."

Several classes of determinants account for human behavior: motivation is one, environment is another. Many psychologists have researched motivation using lower animal subjects such as rats, in spite of the fact that rats do not have human motives - "a white rat is not a human being". Motivation research should therefore be "anthropocentric" rather than "animalcentric". He contended that human behavior is not all motivated in terms of seeking satisfaction for something that is lacked or needed. Maturation, expression and growth or self-actualization do not reflect anything that is lacking in an individual. They are natural tendencies in man that reflect the highest motivations. Maslow theorized that man's needs appear to arrange themselves in a "sort of hierarchy of prepotency". As soon as one level of need in the hierarchy is fairly satisfied another pops up - "man is a wanting animal and rarely reaches a state of complete satisfaction except for a short time". He concluded with the

assertion that a sound "theory of motivation must address itself to the highest capacities of the healthy and strong man as well as the defensive maneuvers of the crippled spirit".²

Theories Applicable to this Research

In this section, an attempt is made to review the theories of motivation thought to have particular relevance to the central theme of this study.

Growth theory. The proponents of this theory hold the view that a deficiency is not necessary for the psychological growth of the individual. The individual has a tendency to grow and develop his full potentialities. Self-actualization, the tendency for the individual to grow and become what he is suited for, is the highest form of motivation. Among the better known proponents of this theory Maslow, referred to earlier, postulated a positive theory of motivation based on his concept of man as a "wanting animal" and his perception of human needs as "a hierarchy arranged in order of relative prepotency". This hierarchy is discussed starting from the lowest to the highest of the needs.

(1) Physiological needs. The lowest of human needs are the physiological needs : food, water, air, rest, sleep, etc. These needs are necessary for the very survival of the

²Maslow, A.H. Motivation and Personality, Second Edition, Publ. Harper and Row, New York, Evanston, and London (1970), p. 19-33.

organism. If physiological needs are not satisfied, the organism is unable to strive to high levels of growth.

(2) Safety needs. If the physiological needs are fairly satisfied a new set of needs called safety needs will emerge. Safety needs include need for security, stability, dependency, protection, freedom from fear, anxiety, and chaos, need for structure, law and order. There are physical as well as psychological aspects of the safety need.

(3) Belonginess and love needs. If the physiological and safety needs of the individual are fairly well satisfied, belonginess and love needs will emerge to pre-occupy the behavior of the individual who will strive for affiliation and friendly relations with other persons, and yearn for affection and understanding.

(4) Esteem needs. The next order of needs to emerge are the esteem needs: positive well-balanced evaluation of the individual by himself and by others. The individual becomes pre-occupied with the desire for status, position, recognition, attention, reputation, and the feeling of being important, being somebody in the crowd.

(5) Self actualization. This is the highest of human needs. The individual whose physiological, safety, affiliation and esteem needs are fairly well-satisfied is still expected to be discontented if he has not actualized what he is suited to be. He would still need to find self-fulfillment. Several

workers in the field of motivation have emphasized that self-actualization is the ultimate motivation force in man. Maslow wrote: "a healthy man is primarily motivated by his needs to develop and actualize his fullest potentialities and capabilities."³ Rogers (1951) suggests that all "organic and psychological needs may be aspects of one basic tendency and striving: the tendency to actualize". He cited other workers that correlate his view point:

(1) Sullivan, who held the view that the "basic direction of the organism is forward";

(2) Horney, who wrote that "the ultimate driving force is the person's unrelenting will to come to grips with himself, a wish to grow and leave nothing untouched that prevents growth";

(3) Goldstein, who first coined the term self-actualization "to describe this one basic striving".⁴

The growth theory of motivation has even become more significant in modern times. Douglas McGregor (1957) applied the growth concept to industrial management. As an alternative to the conventional concept of managing human resources in industry, which had not been very productive, he formulated a theory of management called "Theory Y", based on Maslow's

³Ibid., p. 57.

⁴Rogers, C.R., Self-Centered Therapy - Its Current Practice, Publ. Houghton Mifflin Co., Boston (1951), pp. 487-489.

motivation theory, on the thesis that "man is a wanting animal" whose needs occur in a hierarchy of relative importance. The main postulates of "Theory Y" are as follows:

(1) "Management is responsible for managing the elements of productive enterprise for economic goals"

(2) People are not by their nature passive or resistant to organizational goals. They have become so as a result of experience in organizations.

(3) The motivation, the potential for development, the capacity for assuming responsibility, the readiness to direct behavior toward organizational goals are all present in people. Management does not put it there. It is the responsibility of management to make it possible for people to recognize these characteristics and develop them. The essential task of management is to arrange organizational conditions and methods so that people can achieve their own goals by directing efforts towards organizational objectives".⁵

In contrast to "Theory Y" the conventional concept of management which McGregor labelled "Theory X" is less positive about the nature of man: (1) management is responsible for organizing the means of production to achieve economic goals; (2) the process of management involves motivating people, directing their efforts, modifying their behavior; and (3) without management playing this role, people will be passive or

⁵McGregor, D. "The Human Side of Enterprise" in W.G. Bennis, E.H. Schein, and C. McGregor, eds., Leadership and Motivation Essays of Douglas McGregor. The MIT Press (1957), pages 3-20.

resistant to organizational needs. McGregor implied in this concept those less explicit, negative notions about human beings: the average human being is indolent, not very bright, gullible, lacks ambition and is indifferent to organizational needs.

McGregor proposed a principle of integration whereby organizational objectives and the individual's needs are recognized and provided for. Although directed specifically at industry, the new concept of management appears equally applicable to public educational services, such as extension organizations, since both sectors face the problem of managing human resources.

The Growth Theory of Motivation: Its Relevance to Change in Traditional Agriculture

What is the implication of the preceeding review for inducing change in traditional agriculture? The universality of application is a critical attribute of a good theory. This is not to imply that physical, cultural, social, psychological and economic situations do not influence motivation. What it does imply is that, notwithstanding the specific differences of culture, the basic principles of motivation are applicable anywhere. Maslow made some interesting observations in this regard:

(1) "There are many determinants of behavior other than needs and desires."

(2) "There is now sufficient anthropological evidence

to indicate that the fundamental or ultimate desires of all human beings do not differ nearly as much as do their conscious every day desires. The main reason for this is that two different cultures may provide two completely different ways of satisfying a particular desire, let us say self-esteem. In one society one obtains self-esteem by being a good hunter; in another by being a good medicine man"

(3) The classification of basic needs takes into account "the relative unity behind the superficial differences in specific desires from one culture to another."

(4) The emergence of a need occurs gradually over time, hardly does it do so all at once.

(5) The hierarchy of needs is not rigidly fixed; reversals do occur in it; for instance, self esteem seems more important to some people than love.

These distinctions are pertinent to the Nigerian situation. It seems to me that the affiliative needs of rural Nigerian cultures are fairly well satisfied, in relation to the lower safety need.⁶ The nature of Nigerian societies: the extended family system, the warmth and friendliness of the people appear to be basic reflections of the extent to which the belongingness and love needs are satisfied.

There is empirical evidence that safety (security) considerations greatly influence the attitude and behavior of

⁶This statement is personal; it is not based on any empirical study of need gratification in Nigeria.

Nigerian farmers. Economic studies in rural northern Nigeria show that security and profit maximization goals are of primary concern to farmers in making farming decisions.⁷ Risks and uncertainties such as drought, pests, crop failures, and yield levels pre-occupy the farmer. He manages his resources in order to avoid risks and to make profit. There are indications from other parts of Nigeria that egoistic needs such as the farmer's pride and status are more important motivational factors than economic considerations.⁸ The food needs of the peoples of Nigeria are relatively well-satisfied. It might be safe, to assume, at least in the Nigerian context, with which I am familiar, that a higher order need can be relatively satisfied without first satisfying a lower order need - in this case the belongingness need vis-a-vis the safety need.

Using studies of innovation acceptance in Turkey, Kenya and Mexico, Winkelmann (undated) concluded that profits and risk aversion are the dominant elements shaping farmer response to new technologies⁹, which is consistent with the conclusions of the other studies independently conducted in northern Nigeria.

⁷ Norman, D.W. (1972). Ibid., page 99.

⁸ Personal communications with L.B. Williams, IITA Ibadan, July 12, 1976, Ibid.

⁹ Winkelman, D.L. Promoting the Adoption of New Plant Technology, Centro Internacional De Mejoramiento De Maiz Y Trigo (CIMMYT) Mexico (undated), page 2.

Motivating Clientele Behavior: The Role of Change Agents

The primary role of the extension agent is to help his clientele to learn and grow towards self-fulfillment. Sometimes the motivational techniques used by agents fail to produce results consistent with this objective. Williams and Alao (1972) observe that the process of stimulating and motivating the farmer to accept new ideas or adopt new improved farm techniques is a frustrating task. They add: the decision to accept or reject a new practice is made by the farmer over a period of time and is influenced by cultural, traditional economic and personal considerations.¹⁰

Glegg (1967) used five cases to investigate the practical application of motivation theories in extension work. He concluded that motivation theories have practical application and suggested that extension personnel use motivation theories in their work.¹¹ In another study, Glegg suggested that the growth and development of the extension worker and his clientele can be enhanced by emphasizing the factors directly related to work. Some of the conditions for self-actualization which he proposed are knowledge of new ideas or innovations, support (since growth entails elements of risk) and success

¹⁰Williams, S.K.T. and J. Ade Alao, Increasing Food Crop Production in the Seventies: Evaluation of the Maize/Rice Project in Western State of Nigeria; Proceedings of Agricultural Society of Nigeria, Vol. 9, July, 1972.

¹¹Glegg, D.O., Motivation Theory in Practice, Journal of Cooperative Extension: Spring 1967, pp. 23-29.

(which leads to positive attitudes and commitment).¹²

Ditcher (1968) described encouragement as a "form of psychological vitamin" and suggested that it should be given to strengthen security feelings. He added: "human beings are usually afraid of new and unfamiliar situations that challenge them and will tend to reject them."¹³

Gasson (1973) examined the subject of goals and values in farming occupation in the United Kingdom as a facet of motivation. The farmers which he studied showed predominant orientation to work, valuing the way of life, independence and performance of work task.¹⁴

Watson (1973) investigated the problem of developing small scale farming in East Africa. Agricultural extension services in the region have often been criticized for failing to produce results. Lack of motivation was identified as one of the causes of failure.¹⁵

Boggs (1976) reviewed some major findings on motivation and concluded that they can be applied to program planning in extension. He identified three areas of activity in which learning or changed behavior is the goal: (1) designing the

¹²Glegg, D.O., Work as a Motivator, Journal of Cooperative Extension, pp. 140-148. Vol. 1, Fall, 1963, Number 3.

¹³Ibid., pages 67-71.

¹⁴Gasson, R., Goals and Values of Farmers, Journal of Agricultural Economics (1977) 2413:521-542.

¹⁵Watts, E.R., Reaching East African Farmers, Journal of Administration Overseas (1973), 12, 2:112-124.

instructional program; (2) establishing a climate for learning; and (3) providing support services such as counselling. Extension educators should identify and influence the forces of growth and safety that operate in these areas.¹⁶

Gibson (1978) suggested that to motivate people to participate in extension programs, the costs and benefits of involvement should be identified and communicated to them.¹⁷

Millikan and Hapgood (1967) advise that "to reach subsistence farmers, to convince them that a better life is in fact possible through innovation, the agent of change must thoroughly understand the workings of the local culture - the forces that motivate the farmers and those that inhibit them."¹⁸ They commented further that the government experts who make recommendations to farmers are often not even sure themselves of the results that the technologies will produce at the farmer level.

Motivational Techniques

According to McQuaig (1967), a person's behavior is influenced by his background, training, attitude, philosophy, education, prejudices, temperaments and his emotional make-up.

¹⁶Boggs, D.L., $m = f(g+s)$ or Motivation Equals a Function of Growth Plus Safety, Journal of Cooperative Extension, March/Apr., (1976), Vol. XIV, p. 7-13.

¹⁷Gibson, T.L., Motivation = Benefits Minus Costs; Journal of Extension, Vol. XVI; Jan./Feb., 1978.

¹⁸Millikan, M.F., D. Hapgood, No Easy Harvest: The Dilemma of Agricultural Development in Underdeveloped Countries; Publ. Little, Brown and Company, Boston (1967), p. 87.

The ability to appraise and understand men is, therefore, one of the most important skills in management.¹⁹

In his book, Motivating Human Behavior, Dichter (1968) made suggestions on how to change specific behaviors. Of particular relevance to the extension educator are his views on recommendations: (1) instructions that are confusing or sound difficult can discourage change; (2) motivationally-oriented recommendations can have positive effects on change; (3) a basic mistake often made is for persons making the recommendations to write from their own viewpoint, instead of the viewpoint of the user; (4) the writing of recommendations is often underestimated and under-researched; and, (5) writers of recommendations should take a hint from recipe books.²⁰

Robinson et al. (1975) discussed three techniques for motivating people but advised that flexibility and discretion be exercised, since the exclusive use of any would have undesirable effects. The three techniques are as follows:

(1) Negative style. The philosophical basis of this technique is defined thus: "for an individual to work hard at what he is doing, he must be kept on edge by threats of losing privileges, of losing things he needs or wants and of disapproval or rejection". The behavior styles are threats, punishment and exclusion. The exclusive use of the negative

¹⁹McQuaig, J.H., How to Motivate People, Publ. Frederick Fell, Inc., New York (1967), p. 6.

²⁰Ibid., p. 164-165.

style does not enhance growth and development of the individual.

(2) Permissive style. The philosophy of motivation which this technique is based states: "for a person to develop self confidence and for him to become self-motivated and mature he needs freedom to explore, face new experiences and try out new behaviors". The behavior style of this technique is non-judgemental. It has some motivational value, but the exclusive use of it cannot lead to fulfillment of the self-actualization need.

(3) Positive behavior. The philosophy of positive behavior states that "if people are rewarded for desirable behavior and ignored for undesirable behavior they will be more likely to perform the desirable behavior". The behavior styles are reward, inclusion and involvement. Involvement stimulates people's interest and commitment: "people support what they help create". The probability of a re-enforced or rewarded behavior being repeated is high. Providing incentives is a form of reinforcement. The technique is very valuable in creating a positive healthy self-image and in the fulfillment of self-actualization needs. Exclusive use of the technique can lead to strong control of other person's behaviors. It tends to be manipulative and has been criticized on moral grounds.²¹

With respect to the Nigerian accelerated food

²¹Robinson, J.W., R.A. Clifford, A.C. Wills, Motivation in Community Groups, North Central Regional Extensions Publication No. 36-1136-11, Urbana Champaign (1975), pp. 14-

production program, Sprague et al. (1972) suggested the establishment of farmers' committees at the village level, as a positive behavior style to involve farmers in determining objectives and in general program planning from the "grass-roots".²² The basic principle of motivation that "people support what they help create" is implied. The institutionalization of farmer participation in extension decision making processes in the Nigerian extension system implies institutionalization of recognition of, and respect for farmers.

Nigeria: The Relevance of Improved Agricultural Technology To Farmers' Conditions

Relevance of technology is a critical issue in the development of improved technologies. Because farmers are largely illiterate and are not vocal, their needs are not often voiced and are usually taken for granted.

Specificity of agricultural technology limits its transferability. This calls for adaptive research based on local conditions faced by the farmer. Sprague et al. (1972) suggested that research and production programs for the NAFPP should be "supported with a number of zonal substations sufficient to represent the different agroclimatic zones of the country".²³ Webster (1975) vividly illustrated the problem of specificity of improved technology when he wrote: "a new

²²Ibid., page 22.

²³Ibid., page 18.

variety (of sorghum) developed at the Institute of Agricultural Research, Samaru, Nigeria is adapted to an ecological zone no more than 50 to 70 miles wide north to south."²⁴

Norman (1972) points out that the new technology in northern Nigeria has not been introduced in a way to enhance immediate acceptance by farmers, since extension demonstrations have been based on sole stands. He added: "the possible benefits of new technology on crop mixtures has not been explicitly demonstrated by research workers who have, however, never specified that such technology should not be used on crop mixtures. Farmers have sometimes used some aspects of the technology on crop mixtures. Its impact may be less than it would be under circumstances more conducive to its acceptance".²⁵

Labor Organization and Agricultural Production: The Gandu Farming Unit

The importance of gandu labor was stressed by Hill (1967) when she wrote that family labor force determines the standards of living in rural northern Nigeria. The author found in a Katsina village that the group made up of farming "units which were so far from suffering that they were in a

²⁴Webster, O.J. Sorghum in the Seventies, ed. N.F.P. Rao, L.R. House. Reprinted as Samaru Research Bulletin No. 240 (1975), p. 177.

²⁵Norman, D.W. Initiating Change in Traditional Agriculture, Proceedings of Agricultural Society of Nigeria, Vol. 7, June-July, 1970.

position to render help to others, by gifts or loans" was made up predominantly of gandu units. The group owned more ploughs and mechanical ground nut decorticators, had greater acreage per farming unit, harvested more bundles of millet and were the larger grain dealers. She concluded that the gandu units were more "efficient than other farming units", and speculated optimistically that the "better-off farmers would only be too willing to respond to greater outside efforts to raise their standards of living" and that "their symbiotic relationship with the worse-off is such that they too would benefit".²⁶

The importance of gandu labor is further illustrated by Buntjer who remarked that the breaking up of the composite unit would mean experiencing a shortage of labor.²⁷ The social value of the gandu unit is implied in Groddard's (1973) statement that "traditionally prestige is associated with large families among the Hausa".²⁸

The term gandu appears to have several definitions as Groddard found in the central Sokoto region (area):

- (i) complete gandu - the conventional type in which the gandu head controls the gandu farm;
- (ii) land gandu - in which the fields are centrally

²⁶Hill, P. The Myth of the Amorphous Peasantry: A Northern Nigerian Case Study, Nigerian Journal of Economic and Social Studies (1967), 10:239-60.

²⁷ Ibid.

²⁸Groddard, A.D. Changing Family Structures Among the Rural Hausa, Samaru Miscellaneous Paper No. 196. Publ. Institute for Agricultural Research Samaru, 1973.

controlled and the individual member provides his own tax money from off-farm occupation or from the fields allocated to him by the gandu head;

(iii) cooperative gandu - in which the individual holding and control of land is recognized with each person having his own share. The gandu head has considerable authority on the allocation of production resources, mainly gandu labor and land. Groddard recounts that "the principal advantages of the gandu system lay in the security which it offers to members and the facility for passing down knowledge on farming ideas". This function, he anticipates, will diminish and render the gandu less attractive to members as farming ideas are disseminated through modern channels of information.

Buntjer notes that though the gandu institution is very much alive in Zaria area, it is facing stress from the modernization process and a developing monetary economy.²⁹ As a result, gandu units tend to break up readily. Young people prefer to work for money and they regard gandu work as being imposed. In comparison with the past, the incidence of gandu is in the decrease "where a gandu arrangement is held, it only involves a limited number of people". He noted further that paternal gandu (father-son) is more lasting, and attributed the reason to generational differences and the respect implied.

²⁹ Ibid.

Adoption and Diffusion of Innovation Studies

Rogers (1962) reviewed over 500 publications on the adoption and diffusion of innovations covering diverse fields such as rural sociology, anthropology, education, industry, medical practice, etc., and observed a general consistent trend in the findings of the various researchers.³⁰ Five major characteristics of innovations as perceived by potential adopters affect the rate of adoption: (1) relative advantage, often defined in economic terms (profitability) is the degree to which a new idea is superior to the idea it replaces; (2) complexity, the extent to which an innovation is relatively difficult to understand or to use; (3) compatibility, the extent to which the innovation is consistent with the experiences and values of the potential adopter; (4) divisibility, the extent to which the innovation can be tried on a limited scale; and (5) communicability, the extent to which the results of an innovation can be observed and diffused to others. The interaction effect between variables, the influence of opinion leaders and the promotional activities of change agents also affect the spread of ideas. Based on the evidence assembled, the author proposed a strategy to enhance change:

(1) "a program of change should be tailed to fit the cultural values and past experiences";

(2) before an innovation can be successfully introduced, the potential adopters must perceive a need for it;

³⁰Ibid., page vii.

(3) change agents should direct efforts to improving the competence of their clientele in evaluating new ideas;

(4) in the early stages of the spread of an innovation, change agents should concentrate their efforts on opinion leaders; and

(5) the social consequences of innovations should be anticipated and planned for.³¹

Copp (1958) concluded from a sample of cattlemen in Kansas and dairy farmers in Wisconsin that when similar concepts, measures and statistical techniques are used, the same variables may be important for explaining the adoption behaviors of farmers in different parts of the United States and in different types of farm enterprises. In both cases, size of farm and personality orientations of the operator were the primary variables influencing the adoption behavior.³²

Gross and Taves (1952) investigated the characteristics of adopters and non-adopters of approved agricultural practices in Iowa and found the acceptors to be better educated, had higher social participation, read more experimental publications and subscribed more to magazines.³³ They found no evidence to support the view that acceptors would be younger than

³¹Ibid., page 278-282.

³²Copp, J.H. Toward Generalization in Farm Practice Research, Rural Sociology (1958) 23:101-111.

³³Gross, N. and M.T. Taves. The Differential Characteristics of Adopters and Non-Adopters. Rural Society (1952) 17: 321-328.

non-acceptors.

In India, Bose (1961) found that farmers who adopted more of the improved agricultural practices recommended by the extension service belonged to higher castes, were more literate and had higher participation in community affairs.³⁴

Alao (1971) interviewed 450 farmers in Nigeria and found family size, farm size, mass media exposure, participation in voluntary social organizations and cosmopolitaness positively associated with adoption, while age, literacy and formal education showed no association with the farmers' adoption score.³⁵

Rogers et al. (1970) documented the findings of a research project undertaken to investigate the diffusion of agricultural, health and family planning innovations to rural people in Brazil, Nigeria and India. They found 19 variables to be related to innovativeness: (1) social variables - functional literacy, formal education, level of living, social participation, formal organization leadership, opinion leadership; (2) economic variables - farm size (in acres and laborers); farm production, land tenure status, land fragmentation (negative), farm income; and (3) modernization variables - empathy, political knowledge, knowledge of innovations. Of the nineteen

³⁴Bose, S.P., Characteristics of Farmers who Adopt Agricultural Practices in Indian Villages, Rural Soc. (1961), 26:138-145.

³⁵Alao, J.A. Community structure and Modernization of Agriculture: An Analysis of Factors Influencing the Adoption of Farm Practices among Nigerian Farmers, Ph.D. Dissertation, Cornell University (1971).

variables, they found change agent contact to be one of the most consistent predictors of innovativeness.³⁶

Rice (1974) criticizes Rogers et al. (1974) saying their conclusions overreach their data base. He charged that the researchers had "only included villages in the analysis which change agencies identified as the ones where they had assigned people to work. Thus, if there were progressive villages with very little contact with change agencies, the team would have missed them". He concluded that change agent contact was not a decisive factor in rural development.³⁷

Wilkelmann (undated) found definite patterns in the adoption of improved varieties and fertilizers when farmers in various countries were grouped on the basis of agro-climatic regions. Patterns of adoption were also observed when farmers were grouped by size, with smaller farmers tending to use less. To promote adoption of technology "research must be organized so that the farmers' circumstances play a more central role in developing and evaluating alternative technologies".³⁸

Perrin and Wilkelmann (1976) examined the adoption studies in Kenya, Columbia, El Salvador, Mexico, Tunisia and Turkey to determine the impediments to technical progress in

³⁶Rogers, E.M., J.R. Ascroft and N.G. Roline. Diffusion in Innovations in Brazil, Nigeria and India. Dept. of Communication, Michigan State University, East Lansing (Mimeo) 1970, pages 51-54.

³⁷Rice, E.B. Extension in the Andes: An Evaluation of Official U.S. Assistance to Agricultural Extension Services in Central and South America. The MIT Press; Cambridge, Mass. (1974), pages 390-391.

³⁸Ibid., page 13.

small versus large farms. They found that "to a limited extent, differences in farmer behavior would be explained by differences in information, in availability of inputs, in market opportunities for the crop and differences in farm size and farmer risk aversion or risk perception." They observed that even though at the initial stage, small farmers may lag behind bigger farmers in adoption, they soon catch up. They contended that differences in expected yield explain the reason why some farmers adopt fertilizer and improved seed while others do not.³⁹

Hoffer (1944) found a positive correlation between increased promotional efforts by county extension agents in Michigan and the participation of the people of the counties in extension programs.⁴⁰

Armstrong (1959) determined in some Kentucky counties that the greater the promotional efforts by the county extension agents, the greater the adoption of innovations by the farmers in those counties was.⁴¹

Brown (1972) interviewed 205 farmers in 16 villages in Ghana and found some relationship between extension

³⁹Perrin, R. and D. Winkelmann. Impediments to Technical Progress on Small versus Large Farms. American Journal of Agriculture Economics, Dec., 1976, pages 887-893.

⁴⁰Hoffer, C.R. Selected Social Factors Affecting Participation of Farmers in Agricultural Extension Work. Special Bulletin, 331, June 1944, Michigan State College, Agricultural Experiment Station, East Lansing.

⁴¹Rogers (1962). Ibid., pages 258 and 259, citing Armstrong (1959).

agent/farmer contact and the adoption by the farmers of agricultural innovations.⁴²

Kincaid (1968) warned that unless the more general extension contacts taking place in Nigeria were followed by intensive efforts with individual farmers, little if any persistent adoption of practices would occur. He added: "without persistent adoption by a few farmers, . . . little, if any multiplier effect may be expected to result." He found that farmers were not being given sufficient opportunity to participate in the preparation and management of result demonstrations.⁴³

Sprague et al. (1972) suggested the introduction of mini-kits and production kits to ensure fuller participation of farmers in field demonstrations and in the final phase of research testing in Nigeria. The authors added: "at least weekly visits of the extension agent" should be made to farmers to ensure a more effective agent/farmer contact.⁴⁴

Controversy over the relative importance of economic and social variables in the adoption of innovations exists in the literature. Several sociologists have expressed the view that social determinants are more important than economic

⁴²Brown, C.K. Some Aspects of Adoption of Innovation: A Study of Adoption of Improved Agricultural Practices in the Atebubu and Lawra Agricultural Districts of Ghana. West African Journal of Agricultural Economics, Vol. 1, No. 1, 1972 Proceedings, pp. 186-205.

⁴³Ibid., pages 69-71.

⁴⁴Sprague, E.D., P. Carter, M. Dagg, U.U. Ebong, O.A. Edache, W. Golden, J.C. Moomaw and D. Winkelmann. National Accelerated Cereal Production Survey Team Report to Federal Ministry of Agriculture and Natural Resources. Lagos, Nigeria, (mimeo), 1972.

considerations. Wilkening (1953) wrote: "the acceptance of improved farming practices is determined largely by economic considerations yet, if economic considerations were the only basis of acceptance, improved practices would be adopted as rapidly as their economic advantages were demonstrated. But, not only is there a considerable lapse of time between initial acquaintances and adoption of a practice, but those who would benefit most from improved practices are frequently the last to adopt them."⁴⁵ Brandner and Strauss (1959) defended the sociological viewpoint on the basis of "congruity", or familiarity with a new practice. They based their argument on the spread of hybrid sorghum in Kansas: "if economic need determined the rapidity of adoption of hybrid sorghums, the higher rate of adoption would have been in the Southwestern sorghum area rather than the northeastern corn area. Familiarity or congruence of the new practice with the recently accepted practice of planting hybrid corn probably accounts for the dramatically higher acceptance of hybrid sorghum in the hybrid corn areas". They concluded that "even in a technologically advanced society where people place much value on economic gain, congruity is a basic consideration in the diffusion of innovation." In this particular case, they thought that congruity was relatively more important than the economic need.⁴⁶

⁴⁵Wilkening, E.A., Acceptance of Improved Farm Practices in the Coastal Plain Countries (North Carolina Agr. Exp. Stat. Tech. Bull. 98:Raleigh (1953)).

⁴⁶Brandner, L., M.A. Straus, Congruence versus Profitability in the Diffusion of Hybrid Sorghum, Rural Sociology (1959) 24:381-383.

Economists generally support the view that economic considerations are relatively more important than the social needs. Griliches (1960) attributed about 60 per cent of the variation in the rate of adoption of hybrid corn to economic profitability.⁴⁷ In an effort to counter the contention, Havens and Rogers (1961) reanalyzed an earlier study by Gross and concluded that profitability was not significant to the rate of adoption on a year-to-year basis, using the individual farmer as the basis of analysis. In their opinion "the amount of interaction between individuals who have and have not adopted an innovation determines the rate of adoption for others."⁴⁸ Griliches (1962) disagreed, charging that the test performed by Havens and Rogers was unsatisfactory.⁴⁹ Babcock (1962) wrote in defense of Griliches: "I shall contend that Havens and Rogers could not, on the basis of the data they used, controvert Griliches original findings regarding the exploratory power of economic variables in the analysis of hybrid corn adoption." He argued that the evidence the two authors produced regarding the failure of profitability was "not from

⁴⁷Griliches, Z. Hybrid Corn and the Economic of Innovation, Science, 132:275-280 (1960).

⁴⁸Havens, A.E., E.M. Rogers, Adoption of Hybrid Corn: Profitability and the Interaction Effect, Rural Soc. (1961) 26:409-414.

⁴⁹Griliches, Zuis, Profitability versus Interaction: Another False Dichotomy, Rural Soc. (1962) 27.

a statistical point of view different from certain results reported by Griliches in his 1957 study".⁵⁰

⁵⁰Babcock, J.M., Adoption of Hybrid Corn - A Comment, Rural Sociology (1962), 27, No. 3.

Chapter III

METHODOLOGY

Planning the Survey

The review of literature discussed the varied but applicable aspects of: (1) motivational psychology; (2) adoption and diffusion of innovation studies; (3) sociological and economic factors related to agricultural production in rural northern Nigeria; and (4) improved technologies for guinea corn production in northern Nigeria. There is a great deal of information available on motivation and the adoption of agricultural innovations. There is, however, a dearth of empirical data on the application of motivational theory to the adoption of agricultural innovations in traditional societies. The present study was designed to provide additional empirical data for a traditional society.

Teevan and Smith (1967) suggest that in order to predict behavior, it is necessary, to know, among other things, why the behavior occurs when it does.¹ It was not possible or considered wise to use any in-depth psychological interview procedure in the present study for several reasons. First, reactions by the subjects, who were presumed to be illiterate, to an investigation that might delve into family backgrounds and childhood experiences to establish the psychological topography relevant

¹Teevan, R.C. and B.D. Smith. Motivation. McGraw-Hill Book Co., New York (1967). page (vii).

to the understanding of motivations could not be predicted. They might object to it. This concern was reinforced by the fact that, traditionally, women in the area have been in the background of social participation and are sometimes restricted to the home by religious ethics.² Secondly, interviewers were high school graduates who lacked the skills to conduct psychological interviews. Thirdly, the time constraint made the psychological approach less favorable than the less personal method adopted which was designed primarily to determine "why" subjects did what they did or did not do in their farm enterprises at a particular point in time. It was hoped that such information would provide an insight into the motives that induce subjects to accept, reject, or remain indifferent to improved and recommended agricultural technologies.

Constructing the Questionnaires:
Independent and Dependent Variables

Two questionnaires were constructed. The main questionnaire (Appendix 1) was designed to accomplish the objectives of this study based on individual respondents' reactions. Although potential and logical answers were supplied in the form of a pre-determined "check list" to most questions, the questionnaire was nonetheless open-ended in many respects. Pre-determined answers were intended only to aid interviewers

²The Islamic practice of Purdah is implied in this statement.

in asking and scoring responses more efficiently. Even then, there were provisions where "other" responses, different from those anticipated, could be recorded. Interviewers were trained, and specifically instructed not to read the list of possible answers to respondents while administering the questionnaire. Other questions were left "open-ended" so as to obtain a fuller range of thought from respondents. By combining both methods, it was hoped to gain the advantages inherent in each and to minimize the disadvantages which the exclusive use of either method would produce. Another questionnaire (General Questionnaire - Appendix II) was designed to identify some of the more salient village socio-economic variables that might possibly have a relationship to the success or failure of agricultural modernization programs, such as the NAFPP. The literature provides support for the relevance of such variables to agricultural modernization.³

The independent variables investigated in the study are as follows:

1. Personal characteristics of subjects - age, size of family, literacy, farming experience, family/work organizations, size of family holdings, occupation, community leadership;
2. Extension input - contact of extension agents with farmers, farmer participation in, or exposure to extension guinea corn demonstration plots, guinea corn "mini-kit" plots, guinea corn

³Rogers et al. (1970), Ibid., pages 3-18.

production kit plot.

3. Production inputs: fertilizer, improved seed, labor, tractor and ox-plough use.

The dependent variables investigated are as follows:

1. The adoption of improved guinea corn production practices - improved seed, planting time, seed dressing chemical, seed rate, fertilizer, spacing, weed control, storage insecticides, monocropping, thinning; and
2. The willingness to adopt improved guinea corn production practices.

In order to supervise data gathering personally, the author travelled to Nigeria between September 20 and November 20, 1977. While in Nigeria, consultations were held with government officials at the FMANR, Lagos, and at the MANR, Kano, as well as with researchers at the International Institute of Tropical Agriculture, Ibadan and the Extension and Research Liaison Service of Ahmadu Bello University, Zaria, in order to determine the most appropriate strategy for executing the field survey. Personal supervision and the inputs of the various resource-persons consulted have contributed significantly to improving the quality of this work.

Pre-testing the Interview Questionnaire

The questionnaire was pre-tested at two levels. It was first tested in June, 1977, with Nigerian students at Kansas State University who had previous work experience in agricultural extension in the northern states of Nigeria. The goal was to test the translatability of the questions and to

identify questions that farmers might have difficulty answering. Final pre-testing was done on October 19, 1977 at Tamburawa Village, Dawakin Kudu District of Kano State. The objective of this testing was three-fold: (1) to test the performance of the nine high school graduates who had completed training as interviewers; (2) to see if the length of the questionnaire would jeopardise the attention and interest of respondents; and (3) to identify possible ambiguities. The questionnaire was revised after each level of testing. It was subsequently translated into Hausa by ERLS specialists at Ahmadu Bello University, Zaria, to avoid the loose translations observed during training and testing.

Selection and Training of Interviewers

Language and cultural differences can hamper effective communication between individuals. Interview-type research depends to a large extent on effective communication to obtain the responses that truly reflect the views of subjects. Hence, the need to bridge any communication gap that may exist between researchers and subjects in survey research. For this purpose it is sometimes necessary for some other individual to play an intermediary role between the researcher and the subject. This strategy can be used to bridge the "heterophily gap" which Rogers et al. (1970) define as "the degree to which two or more individuals who interact differ in technical competence, education, socio-economic status and attitudes, etc." ⁴

⁴ Op. cit. P. 1-12.

Efforts were made to minimize heterophily problems in the study by using interviewers who had a similar cultural background and spoke the same language as the subjects. With the exception of one person, all the interviewers were indigenes of Kano State.⁵

In addition, it was decided to conduct the study through the Kano State Ministry of Agriculture and Natural Resources which had primary responsibility for agricultural extension work in the study area. In order to facilitate the survey, the FDA requested support for the survey from the Kano State M.A.N.R., which in turn assigned the senior official of the Ministry responsible for coordinating the NAFPP sorghum program to the survey. The Ministry also requested its field staff to cooperate with the survey and to assist with local arrangements. These arrangements were decisive in winning the support of the community leadership, as well as the confidence of the subjects, which enhanced the motivation of respondents to freely express their true feelings.

The interviewers were prospective employees of the Kano State M.A.N.R. who had been interviewed for employment and were expecting to hear the results when they were hired on a temporary basis for the work. The prospect of employment would have enhanced their motivation to conduct the survey with dedication and enthusiasm. They were mostly young high school

⁵The non-indigene spoke Hausa fluently and has been resident in the State. He was quite homophilous with the other interviewers as well as the subjects.

graduates.⁶

An alternative source of interviewers which was initially considered was the extension workers in the survey villages. This idea was discarded for two main reasons:

(1) training and actual survey work would take the extension agents away from their extension duties which were thought to be pressing; and (2) the vested professional interests which village extension workers might have in the survey could bias the results.

The training, which lasted two weeks, started with an explanation of the objectives of the survey and the role of interviewers in accomplishing those objectives. Because most trainees had no previous training in agriculture it was necessary to include in the training those aspects of technical agriculture relevant to the survey. In particular, the "recommended practices for guinea corn production" were thoroughly covered. Field trips were arranged to help trainees recognize the types of field demonstrations and cultural practices covered in the questionnaire. Samples of the agricultural chemicals recommended by extension workers for guinea corn production were displayed and discussed to help trainees recognize and differentiate between them. Most of the training was devoted to teaching trainees how to administer the questionnaire. The training conducted at the Farm Training Centre, Kano, was in English, as well as in Hausa, the language in

⁶The only person in the group without secondary or equivalent education had special agricultural training which the others lacked.

which the questionnaire was to be administered. The Hausa translation of the questionnaire was fully discussed. Trainees commended the translation in its entirety and commented that it would aid them in conducting a more efficient survey. They were instructed to use the translated version in conducting interviews.

Selection of Villages and Respondents

The sampling procedure used for selecting districts, villages and respondents was both judgmental and random. Judgmental sampling decisions were made to ensure that some of the defined objectives of the study were accomplished. Random sampling decisions were made to ensure that all subjects in the population had a fair chance of being selected, in order to enhance wider application of the findings. The districts randomly selected by Williams et al. (1975) for a sorghum production bench mark survey in Kano State were used in the present study.⁷ The primary reason for using the same districts was that at the time the present study was designed in the United States, there was lack of data on Kano districts and villages to base meaningful sampling decisions. The districts used in the bench mark survey had been selected to reflect "the three ecological zones delineated on the basis of rainfall distribution, soil characteristics and crop yields."

The original proposal was to interview 30 farmers from

⁷Williams, L.B., R.B. Thakare, and H. Tudun Wada. Sorghum Bench Mark Survey, Kano State (1975) IITA, Ibadan (mimeo), page 2.

each of the six villages sampled in the bench mark survey. Half of the subjects would have been randomly selected from the farmers that had taken part in the NAFPP. The other half would have been randomly selected from those farmers who had not taken part in the Project. This approach was revised when it was observed on arrival in the State that the farmers who had taken part in the NAFPP in the villages were too few to make meaningful comparison. The village base had therefore to be increased. All the villages where the NAFPP was operating, or had operated in the past, in the 6 districts were included in the sample. The number of villages subsequently sampled was 16, compared to 6 originally planned.⁸

Selection of Respondents

The village tax list of individual adult males was the basic document used for selecting respondents. Because that list was compiled on hamlet basis, it was necessary first to make a random sampling of the hamlets to select those that would be representative of the entire village. It was not

⁸Three villages were dropped. The first was dropped partly because of problems of accessibility and partly because it fell in an ecological zone different from most villages in the district. That particular ecological zone had been covered previously in the survey of two other districts. The second village was dropped because the two farmers who had taken part in the project had moved to another village. The third was dropped because one of the participants was a school teacher who was on transfer to another village. The other participant was leaving the village for college training. Besides, the tax list for that village had been taken to the district headquarters and therefore not available for use in selecting the respondents.

possible to determine before hand, a fixed hamlet sample size because the number of hamlets and their size varied from village to village.

In each survey village, the list of hamlets that make up the village was obtained from the village head. Where the hamlets in the village were contiguous, they were all considered in determining the sample, otherwise only the accessible hamlets were used. The names of the hamlets were written on a piece of paper, folded, and placed in a container. After they had been thoroughly mixed, numbers were drawn depending on the relative size of the village and on the number of NAFPP participants residing in the village. All the subjects who took part in the pre-testing at Tamburawa Yamma were excluded from the sample. Because of the small number, all the NAFPP participants in each village were included in the sample. The table of random numbers was used to select the subjects from the larger population of non-participants. Due to lack of records, it was often not possible to determine before hand the number of farmers to interview in a village, or even the villages to sample in a district until the village and district or local government headquarters had been visited to collect the relevant data. Sometimes the village head was relied upon to supply the names of NAFPP participants, especially when the extension agent was not in the village at the time of the visit. The village head is probably the most important legitimizing source in the village. Official information to villagers is channeled through him. He was, therefore, assumed

to be knowledgeable about the village extension service. The information obtained from village heads regarding the participation in NAFPP by subjects was correct most of the time when checked with respondents. A few respondents could not correlate the village head's information in which case the respondent's statement was accepted and he was placed in the non-participant category.

Conducting the Survey

A courtesy visit was made to the chairman and secretary of the local government council, during which the purpose of the survey was explained. A similar visit was made by the researcher, in company of the MANR Official assigned to the survey and the divisional agricultural officer responsible for supervising extension work in the district, to the district head, the traditional ruler of the district, to seek his support and the cooperation of his subjects. District heads sent emissaries to take the survey team to the village heads. This was very helpful in winning the support and cooperation of village heads and villagers alike. After the subjects had been selected, village heads were asked to request the subjects to make themselves available for interviewing at a time mutually arranged with the village head.

Before the questionnaire was administered, the objectives of the survey were explained to each subject, as an introduction to the interview (see Appendix III - Introduction). It was often possible to make the introduction to subjects as

a group except where they did not all turn up together, in which case the introduction was made individually to subjects before actual questioning began. The questionnaire was administered to each subject in a private place. The objective was to avoid any influence which the responses of one respondent might have on other respondents. Each interview took approximately 30-45 minutes. There was no observed loss of interest, or boredom, on the part of respondents. One interviewee terminated the visit at the half-way point because he had other business to attend to. One questionnaire was discarded because the respondent made contradicting and seemingly false statements. Approximately 77 percent of the target sample was interviewed; the remaining 23 percent was not available. The distribution of farmers interviewed is presented on district basis in Table 1.

After the survey in each village was completed, the questionnaires were briefly reviewed to detect any mistakes that could be corrected before the departure of the survey team, or of the respondent from the village. Some mistakes and ambiguities in recording subject's responses were detected and corrected.

The general questionnaire was administered to the village head or any other person designated by him. The survey started in Dawakin Kadu District on October 27, and ended in Birnin Kudu District on November 9, 1977.

In a preceeding chapter, some assumptions were made which were thought to be relevant to the usefulness of the

TABLE 1
DISTRIBUTION OF FARMERS INTERVIEWED BY DISTRICTS

District	Number of Farmers	
	Target Sample	Interviewed
Roni	30	30
Gagarawa	30	24
Dawakin Kudu	30	27
Karaye	30	13
Birnin Kudu	30	22
Gwaram	30	22
Total	180	138
Farmers interviewed as percentage of target sample:		76.67

findings and conclusions of this study. In this section the efforts made to safeguard the assumptions are discussed.

Assumption number 1 - that interviewers were capable of correctly conveying the meaning of questions to subjects and accurately and adequately recording subject's responses. The translation of the questionnaire, the training and testing of interviewers were intended to ensure this assumption.

Assumption number 2 - that respondents expressed their true feelings and facts, as known to them, and that these feelings

and facts are shared by the preponderance of the population. To ensure this, careful efforts were made to win the confidence and cooperation of subjects and community leaders. A climate of trust and confidence enhances open and frank exchange of ideas between individuals. The random selection of respondents was intended to ensure fair representation in the sample of the entire farm population.

Assumption number 3 - that the needs of respondents do not differ from the needs of small-scale farmers in northern Nigeria. The physical and socio-economic environment of the Kano sorghum farmer is fairly typical of the environment of the northern Nigerian sorghum farmer. Their needs are, therefore, thought to be similar.

Assumption number 4 - that appropriate agricultural technology and extension techniques are being used in the study area. The innovations and techniques being used in the study area are based on studies conducted over the years by IAR, Samaru, which makes recommendations to the farmers in the northern states that includes Kano State.

The Study Area

Table 2 illustrates the distribution of respondents by villages, districts and zones. Table 3 summarizes the main characteristics of the sample villages determined from the general questionnaire. Fig. 1 illustrates the location of the districts studied. Some variables were thought to be rather too poorly developed to be considered

TABLE 2

DISTRIBUTION OF FARMERS INTERVIEWED BY ECOLOGICAL
ZONES, DISTRICTS AND VILLAGES

Ecological Zone	Districts	Villages	Number of farmers interviewed (NAFPP in brackets)
I	Roni	Roni	10 (2)
"	"	Dansure	7 (1)
"	"	Ungwar Mani	13 (2)
"	Gagarawa	Medi	15 (1)
"	"	<u>Garin Ciroma</u>	<u>9 (2)</u>
Subtotal	<u>2</u>	<u>5</u>	<u>54 (8)</u>
II	Dawakin Kudu	Dawakin Kudu	8 (0)*
"	" "	Tamburawa Yamma	7 (5)
"	" "	Dawakiji	4 (2)
"	" "	Tsakuwa	8 (3)
"	Karaye	Karaye	4 (1)
"	"	Yola	4 (0)**
"	"	<u>Kwanyawa</u>	<u>5 (0)**</u>
Subtotal	<u>2</u>	<u>7</u>	<u>40 (11)</u>
III	Gwaram	Jikas	11 (2)
"	"	Nassarawa	11 (2)
"	Birnin Kudu	Yalwan Damai	10 (2)
"	" "	<u>Kantoga</u>	<u>12 (3)</u>
Subtotal	<u>2</u>	<u>4</u>	<u>44 (9)</u>
Total	<u>6</u>	<u>16</u>	<u>138 (28)</u>

* Although a legitimizing source in the village had identified certain individuals in this village as having participated in the NAFPP, the statements made by these individuals during the interviews did not corrolate with their reported status of participation.

** None of the NAFPP participants in this village was available for interviewing.

TABLE 3

CHARACTERISTICS OF SAMPLE VILLAGES

Village	Population Adult Males	Motor road	Market	Member cooperative union residing	Health care facilities	Schools	Young farmers' clubs	Fertilizer sold	Miles to buy fertilizer	Improved Seed sold	Miles to buy seed	Radio sets no.	TV sets	Extension	
														Council	Agent residing/ visiting years
D/Kudu	1780	A.S.	Y	Y	Y	P.p.	Y	Y	n.a.	N	15	300	Y	Y	40
Tamburawa	1410	A.S.	Y	N	N	P	N	N	13	N	13	120	N	N	10
Tankuwa	2273	A.S.	Y	Y	N	P	N	N	8	N	20	300	N	N	2
Dawaklji	1034	Y	Y	Y	N	P	N	Y	n.a.	Y	n.a.	100	N	N	n.a.
Roni	1035	A.S.	Y	Y	Y	P	Y	Y	n.a.	Y	n.a.	100	N	N	20
Dansure	588	A.S.	Y	Y	N	P	N	N	8	N	8	20	N	N	15
Unpuwar Mani	1112	A.S.	N	N	N	P	N	Y	n.a.	Y	n.a.	20	N	Y	30
Kafaye	1192	A.S.	Y	N	Y	P.p.	Y	Y	n.a.	Y	n.a.	700	N	N	45
Yola	486	A.S.	N	N	N	P	N	N	7	N	7	100	N	N	17
Kwanyawa	1000	N	N	Y	N	P	Y	N	13	N	13	10	N	N	3
Garin Ciroma	560	A.S.	N	N	N	P	N	N	7	N	7	12	N	N	3
Hedi	295	A.S.	Y	Y	Y	P	N	Y	n.a.	N	12	15	N	N	22
Jikau	635	S	Y	Y	N	P	N	Y	n.a.	N	6	50	N	N	15
Naasarawa	150	A.S.	Y	N	N	P	N	N	3	N	3	30	N	N	n.a.
Yalwan Damal	1260	A.S.	Y	Y	N	P	Y	Y	n.a.	N	n.a.	30	N	N	4
Kantoga	1003	A.S.	Y	N	N	P	N	N	10	N	10	20	N	N	4

KEY:

A.S. = All season road
S = Seasonal road
Y = Yes
N = No

n.a. = data not available, not applicable

P.p. = Primary and post-primary schools

P = Primary school

R = Resident

V = Visits, not residing

in the questionnaire. In retrospect, variables such as rural water supply should have been investigated. Rural electricity was omitted as an index of development because it was thought that the villages with the facility, if any, would be very few. That assumption might not be wrong.

Aspects of village variables thought to be related to change in agriculture in the northern states are discussed briefly in this section to provide some background. Road development is important for obvious reasons: opening up new markets for agricultural and manufactured goods; facilitating trade, and movement of people, exchange of ideas; orienting people towards outside influences which might have modernizing advantages; supplying farm inputs. Inputs such as fertilizer and improved seed have to be available, in the first instance, before they can be used. Institutional development such as schools, extension service, businesses, cooperatives have modernizing influences. Radio is an important source of agricultural information. Television programs directed towards rural viewers will have tremendous modernizing influences, if viewing facilities are available and the programs are appropriate. Contact of extension workers with farmers is important in inducing change in agriculture. Population concentration influences institutional development and the provision of social services. It also provides a wider base for social interaction.

The level of development of social and institutional facilities differed to some extent among the 16 sample villages. All 16 villages had primary schools, with two having post

primary schools. Thirteen of the villages were accessible by all-season roads whose structures varied from the hard surface tarmac road passing through Kantoga village to the dusty dirt roads leading to the more remote villages. One village had no proper access road while another had an access road that was motorable only during the dry season. Health care facilities were available in four villages. Fertilizer was sold in half of the villages. The farmers residing in the other villages where fertilizer was not sold had to travel an average of 8.6 miles to be able to buy fertilizer. Improved seed was sold in four villages. The average distance farmers had to travel from their villages to be able to buy improved seed was 10.5 miles.

Ownership of radio sets varied considerably among the villages. There was an estimated 700 radio sets in Karaye village, compared to 10 in Kwanyawa. Although extension agents were residing in 15 of the villages, only two had extension councils or committees. One-third of the sample villages had their first extension agents within the past five years, compared to Karaye which had its first extension agent about 45 years ago.

Treatment of Data

The responses obtained from the sample of farmers were coded and transferred onto a coding form from which they were key-punched on IBM cards. The data were analyzed at the

Kansas State University Computing Center using Statistical Packages for the Social Sciences (SPSS).

Statistical Test

The data were analyzed with a view to testing the hypotheses postulated in an earlier chapter. The analysis was further intended to achieve the specific objectives of the study.

The chi-square statistic, x^2 was used to test the relationship between variables. It was derived from the formula:

$$x^2 = \frac{\sum(O-E)^2}{E} \quad \text{where}$$

O = observed cell count,

E = expected cell count computed in each case by multiplying the row total by the column total of the contingency table and dividing the product by the total number of measurements in the sample.⁹

The critical value for rejecting or accepting a null hypothesis was determined by comparing the computed x^2 with chi-square distribution table at the .05 probability level, using the degrees of freedom computed from the two-way classification of the data. The degrees (d.f.) were computed using

⁹Mendenhall, W., L. Ott, and R.F. Larson. Statistics: A Tool for the Social Sciences. Duxbury Press, North Sitate, Massachusetts, pages 321-322.

the formula:

$$d.f. = (r-1)(c-1) \quad \text{where}$$

r = row total

c = column total

The null hypothesis was accepted if the computed χ^2 was less than the critical value, otherwise it was rejected.

The chi-square statistic can be accepted as an appropriate test if for each cell in the contingency table the expected cell count is equal to or greater than five.¹⁰ This rule of thumb was followed in analyzing the data.

Where appropriate, Fisher's exact test was used. It is a non-parametric test which may be used when the sample count is small. It is given by the formula:

$$P(X_1, X_2) = \frac{n_1! \ n_2! (x_1 + x_2)! (n_1 + n_2 - x_1 - x_2)!}{(n_1 + n_2)! \ x_1! x_2! (n_1 - x_1)! (n_2 - x_2)!}$$

where $P(X_1, X_2)$ is the exact probability of observing x_1 and x_2 successes from independent random samples of sizes n_1 and n_2 . $P(X_1, X_2)$ is computed by taking the ratio of the products of the factorials for the marginal totals to the product of the factorials of the individual cell counts and the total sample size $n_1 + n_2$.¹¹ The null hypothesis is rejected if the sum of probabilities computed is less than $\alpha = 0.05$.

¹⁰Mendenhall et al., op. cit., pages 325-326.

¹¹Mendenhall et al., op. cit., pages 333-336.

A variable is considered to be related to adoption behavior if the statistical test shows its relationship to be significant at the .05 probability level to at least one of the following five recommended practices: improved varieties, seed dressing chemical, close spacing, fertilizer and storage insecticide.

Chapter IV

RESULTS AND DISCUSSION

Characteristics of the Farmers

The personal characteristics of the sample population are illustrated in Table 4. Seventy-two percent of the sorghum farmers in Kano state were under 50 years of age. This corresponds closely to Williams et al. (1975) estimate of 67 percent derived from a sample of six villages in the state.¹ The size of households varied from 2 to 39 persons, with a mean and median of 10.6 and 8.2, respectively. The occurrence of a few large families would have distorted the mean, hence the need for the median. Comparable data for three villages in Zaria, studied by Norman (1972), are 7 and 8.5, respectively.² It should be noted that Kano is the most densely populated state in northern Nigeria. The data confirm earlier findings in Zaria and Sokoto, that the incidence of gandu is less common than ivali.³ Of the 138 farmers interviewed, 67 percent (93) were from ivali households; the remaining 32 percent (44) were from gandu households. This finding compares well with Buntjer's

¹Op. cit., pages 4-5.

²Op. cit., page 19.

³Gandu is a composite farming unit consisting of two or more adult males, with their wives and children. Ivali is a simple family unit consisting of a married man, his wife or wives and dependent children. (See also Chapter II, pages 41-43 for a fuller discussion on family labor.)

TABLE 4

CHARACTERISTICS OF THE SAMPLE OF FARMERS SURVEYED IN
KANO STATE, NIGERIA, 1976-77

	Number	Percentage of total sample
Age distribution:		
below 30 years	21	15.2
30 - 39 "	40	29.0
40 - 49 "	38	27.5
50 - 59 "	32	23.2
Over 60 "	7	5.1
Size of households by class:		
2 - 5 persons	36	26.1
6 - 11 "	58	42.0
> 11 "	44	31.9
Family/work organizations*:		
<u>iyali</u>	93	67.4
<u>gandu</u>	44	31.9
Family labor force by class:		
1 - 3 persons	95	68.8
> 3 "	43	31.2
Status:		
Hold official position	28	20.3
Hold no official position	110	79.7
Heads of compound	99	71.7
Non-heads of compound	39	28.3
Heads of household	128	92.8
Non-heads of household	10	7.2
Literacy		
Arabic and Roman scripts	33	23.9
Arabic script only	85	61.6
Roman script only	2	1.4
Neither Arabic nor Roman	18	13.0
Education (formal):		
7 years elementary school attendance	3	2.2
< 7 years elementary school attendance	5	3.6

TABLE 4 (continued)

	Number	Percentage of total sample
Education (adult literacy):		
7 years adult literacy attendance	3	2.2
< 7 " " " "	27	19.6
> 7 " " " "	3	2.2
Farming experience**:		
1 - 7 years	26	18.8
8 - 27 "	79	57.2
> 27	26	18.8
Education (Koranic School)***:		
> 7 years attendance	42	30.4
7 " "	14	10.4
< 7 " "	63	45.7
Occupations:		
Full-time farmers	44	31.9
Farmers having off-farm occupations	94	68.1
Size of guinea corn farms:****		
1.04 - 2.4 acres	22	15.9
2.6 - 13.1 "	96	69.6
> 13.1 "	20	14.5

* One farmer did not supply information.

** Seven farmers gave no response.

*** Of the 138 farmers, 119 had attended Koranic School.

**** Derived from labor input data; conversion explained on page 96.

(1970) estimate of 32.2 and 67.8 percent gandu and iyali households, respectively, in Zaria.⁴ Seventy-three percent of the gandu units were paternal, 23 percent fraternal, 3 percent uncle-nephew and 3 percent other types. The size of the family labor force varied from 1 to 28 persons with a mean and median of 3.1 and 2.5, respectively. Twenty-nine percent (41) of the farmers interviewed said they were "farming alone", implying that no other member of their household works on regular basis on their farms. Women and children aged over 12 years, usually considered to be a part of the family labor force, would not have been regarded by these respondents as part of the labor force. The practice of purda among Muslims makes women contribution to agricultural labor force negligible. Approximately 69 percent of the respondents were from households having a labor force of one to three persons; the remaining 31 percent were from those households having a labor force of over three persons.

Most of the farmers (68 percent) had off-farm occupations, compared to 32 percent who had no occupation besides farming. Thirty-six percent (50) of the farmers sampled were part-time small-scale traders, 5 percent (7) teachers (Koranic), 4 percent (6) cattle herders, 4 percent (6) butchers, 2 percent (3) tailors, 2 percent (3) laborers, 1 percent (2) barbers. Thirteen percent (18) of the respondents were in various occupations such as bicycle repair and hire, blacksmithing, small

⁴ Ibid., pages 4-5.

scale-contracting, preaching, pottery, weaving, building, and money lending. One respondent had three occupations in addition to farming. He was engaged in trading, tailoring, and money-lending. Of the 94 respondents having off-farm occupations 72 percent (68) undertook their occupations all-year round. The remaining 28 percent pursued off-farm occupations only during the dry season.

Twenty-four percent (33) of the farmers sampled had attended adult literacy classes, six of whom completed seven years attendance. Only 2 percent had completed seven years of primary school education. Twenty percent (28) held official positions in the village or district. There were two village heads, five scribes/assistant scribes, seven hamlet heads, one councillor, two members of cooperative union, four members of agricultural extension committee, and eleven others.⁵ One respondent held three positions. He was a councillor, scribe and hamlet head.

Characteristics of Family Farming Units

Several characteristics of Kano farmers are assessed in this section with a view to determining their possible influence on adoption behavior. Preliminary tests were made to determine which characteristics were contingent to family/work organization in order to have a proper basis for data treatment in

⁵This group was made up mainly of traditional titles such as Sarkin pawa, Sarkin rafi, Makama, Sarkin zuma. There were also religious titles, such as Iman linami.

subsequent sections. Table 5 (a, b, c) provides evidence to support the view that gandu family units had larger size farms, stronger labor force and greater number of persons than the iyali units. The differences between the two farming units with respect to the labor and family size were statistically significant at the .01 probability level. The differences in the size of guinea corn farms were significant at the .05 level.

The contingency table relating occupation to family/work organization does not suggest a significant difference in the affiliation of the two groups to off-farm occupations (Table 5f). On the other hand, the relationship between seasonality in off-farm occupations and family/work organization was found to be significant at the .01 probability level (Table 4e).

A preponderance of gandu respondents, 93 percent (28), undertook off-farm occupation all year round, whereas only 62 percent (40) of the iyali pursued off-farm occupations year-round. A possible explanation for the observed differences is that the gandu head having a larger labor force under his control can afford to devote more time to off-farm undertakings, which sometimes yield greater income than farming. Since there is division of labor in a gandu association, it is likely that the gandu head will delegate his supervisory duty to a subordinate when he undertakes off-farm occupations. Another possible explanation is that the relatively well-off gandu head can afford hired labor.

It is important to draw a distinction between the absolute size of family labor force and the adequacy of labor

TABLE 5

COMPARISON OF FARMER CHARACTERISTICS IN IYALI AND GANDU
FAMILY SYSTEMS IN KANO STATE, NIGERIA, 1976-77

Characteristics	Percent farmers in system (number in brackets)		
	Class	Iyali	Gandu
(a) Size of farm, as measured by labor in- put, mandays	4-11	19.4 (18)	9.1 (4)
	12-64	71.0 (66)	65.9 (29)
	>64	9.7 (9)	25.0 (11)
	$x^2 = 6.873$, significant at .05 level.		
(b) labor force (class)	1-3	79.3 (73)	50.0 (22)
	>3	20.7 (19)	50.0 (22)
	$x^2 = 10.820$, significant at .01 level.		
(c) Size of family (class)	2-5	37.0 (34)	4.5 (2)
	6-11	46.7 (43)	34.1 (15)
	>11	16.3 (15)	61.4 (27)
	$x^2 = 32.497$, significant at .01 level.		
(d) Labor situation	Inadequate	43.7 (44)	40.1 (18)
	Adequate	52.7 (49)	59.9 (26)
	$x^2 = 0.270$, not significant.		
(e) Off-farm occupa- tions, seasonality	Year-round	61.5 (40)	93.3 (28)
	Dry season only	38.5 (25)	6.7 (2)
	$x^2 = 8.697$, significant at .01 level.		
(f) Occupations, affiliation	Have off- farm occupa- tions	72.0 (67)	59.1 (21)
	Have no off- farm oc- cupations	28.0 (26)	40.9 (18)
	$x^2 = 1.743$, not significant.		

TABLE 5 (continued)

Characteristics	Percent farmers in system (number in brackets)		
	Class	Iyali	Gandu
(g) Age (years)	Below 30	16.1 (15)	11.4 (5)
	30-39	30.1 (28)	27.3 (12)
	40-49	29.0 (27)	25.0 (11)
	50-59	21.5 (20)	27.3 (12)
	Over 59	3.2 (3)	9.1 (4)
	$x^2 = 3.158$, not significant		
(h) Farming experience (years)	1-7	20.2 (18)	19.0 (8)
	8-27	59.6 (53)	61.9 (26)
	>27	20.2 (18)	19.0 (8)
	$x^2 = 0.066$, not significant		
(i) Ox-plot utiliza- tion	Used no		
	ox-plows	41.8 (38)	40.9 (18)
	Used ox- plows	58.2 (53)	59.1 (26)
$x^2 = 0.009$, not significant			

for farm operations. Numerical strength of family labor does not, per se, imply adequacy of labor supply. The farming unit with a strong labor force often cultivates larger acreages.⁶ Large farming units could be constrained by labor shortage, in the same manner that small ones would. Table 5d suggests that gandu farming units, which have been shown to have stronger labor force than the ivali (Table 4b), do not enjoy more adequate labor for farm operations than the ivali.

Contrary to expectations, there was no significant difference between ivali and gandu heads in farming experience as determined by the number of years respondents had been heads of households (Table 5h). Similarly, there were no significant differences in age between ivali and gandu respondents. This finding may not controvert earlier reports. The sample population was drawn from taxable adult males which includes both heads and non-heads of households. Unlike the farming experience data, the age data was not restricted to heads of households. Young people have a tendency to set up their own farming units once they are married and to remain unassociated in a farming arrangement of the gandu type to their old age.

It was expected that gandu respondents would use more ox plow than the ivali. Table 5i suggests that there are no real differences between the two classes of respondents as far as

⁶A farming unit means a group of persons, usually from the same family (household) farming together. It refers to the gandu as well as ivali units. A gandu association is sometimes composed of individuals from more than one household.

TABLE 6

RELATIONSHIP BETWEEN AGE AND THE ADOPTION OF RECOMMENDED
SORGHUM PRODUCTION PRACTICES AMONG A SAMPLE OF FARMERS
IN KANO STATE, NIGERIA, 1976-77

(a) Adoption of improved seed

Age group	Percent farmers adopting varieties (number in brackets)			Total
	Local	Local and improved	Improved	
Below 30	65.0 (13)	15.0 (3)	20.0 (4)	100.0 (n=20)
30 - 39	57.5 (23)	15.0 (6)	27.5 (11)	100.0 (n=40)
40 - 49	57.9 (22)	31.1 (8)	21.1 (8)	100.1 (n=38)
50 - 59	56.3 (18)	12.5 (4)	31.3 (10)	100.1 (n=32)
Over 59	57.1 (4)	0.0 (0)	42.9 (3)	100.0 (n=7)
Total	80	21	36	137

(b) Adoption of seed dressing

Age group	Adoption behavior		Total
	Percent farmers not adopting (number in brackets)	Percent farmers adopting (number in brackets)	
Below 30	40.0 (8)	60.0 (12)	100.0 (n=20)
30 - 39	25.6 (10)	74.4 (29)	100.0 (n=39)
40 - 49	18.4 (7)	81.6 (31)	100.0 (n=38)
50 - 59	37.5 (12)	62.5 (20)	100.0 (n=32)
Over 59	14.3 (1)	85.7 (6)	100.0 (n=7)
Total	38	98	136

TABLE 6 (continued)

(c) Adoption of close spacing

Age group	Adoption behavior		Total
	Percent farmers not adopting (number in brackets)	Percent farmers adopting (number in brackets)	
Below 30	38.1 (8)	61.9 (13)	100.0 (n=21)
30 - 39	31.6 (12)	68.4 (26)	100.0 (n=38)
40 - 49	44.7 (17)	55.3 (21)	100.0 (n=38)
50 - 59	56.3 (18)	43.8 (14)	100.0 (n=32)
Over 59	42.9 (3)	57.1 (4)	100.0 (n=7)
Total	58	78	136

(d) Adoption of fertilizer

Below 30	10.5 (2)	89.5 (17)	100.0 (n=19)
30 - 39	5.3 (2)	94.7 (36)	100.0 (n=38)
40 - 49	5.4 (2)	94.6 (35)	100.0 (n=37)
50 - 59	13.3 (4)	86.7 (26)	100.0 (n=30)
Over 59	0.0 (0)	100.0 (6)	100.0 (n=6)
Total	10	120	130

ox plow use is concerned. The present study did not, however, investigate ownership of plows between the two classes of respondents. Some studies have suggested that the gandu are more likely to own ox plows than the ivali. The group possessing more plows should be expected to use plows more than the group with less plows, even if there is much plow hiring, as reported elsewhere in northern Nigeria in the literature.

Personal Characteristics and the Adoption of Recommended Practices

Several variables thought to be contingent to the organization of farming units were considered in the preceeding section. The chi-square statistic showed no significant differences in age, farming experience, ox plow utilization and affiliation to off-farm occupations between the ivali and gandu respondents. These variables would not, therefore, be expected to influence the adoption behavior of the two classes of respondents differently. Hence, the possible effects of these variables are assessed in this section without controlling for the effects of the structure of the family farming unit. The chi-square statistic showed family size, family labor force, farm size and seasonality in off-farm occupations to be significantly related to the organization of farming units. The influence of family farming organization is controlled in the analysis to enhance a clearer understanding of the role of these variables in the adoption behavior of respondents.

This section is intended to test the hypothesis that

there is no relationship between the personal characteristics of farmers and the adoption of recommended guinea corn production practices.

Age and the adoption of recommended practices.

Table 6 suggests that there is no consistent trend in the adoption of improved practices by farmers of different age groups. This finding is of interest, since several researchers have linked innovativeness with youth. Young persons, though naturally more receptive to new ideas and practices, can be constrained by social and economic forces within their environment not to be more innovative than the older persons who have been more conditioned by the traditional culture system. Such forces include lack of liquidity and status. Age is an important determinant of seniority and leadership roles in farming units and in the community.

Farming experience and the adoption of recommended practices. In an effort to assess the influence of farming experience on the adoption of recommended practices, respondents were classified according to the number of years they had been heads of households, and their adoption behavior compared (Table 7). Duration of headship of household was used as an index of experience because it marks the period when the farmer assumes a decision-making position within the farming

TABLE 7

RELATIONSHIP BETWEEN FARMING EXPERIENCE AND THE ADOPTION OF
RECOMMENDED SORGHUM PRODUCTION PRACTICES AMONG A SAMPLE
OF FARMERS IN KANO STATE, NIGERIA, 1976-77

(a) The adoption of fertilizer

Adoption behavior	Percent farmers classified by years of farming experience (number in brackets)			N
	1 - 7	8 - 27	> 27	
Did not adopt	12.5 (3)	8.0 (6)	0.0 (0)	9
Adopted	87.5 (21)	92.0 (69)	100.0 (24)	114
Total	100.0 (n=24)	100.0 (n=75)	100.0 (n=24)	123

$\chi^2 = 2.897$, not significant

(b) The adoption of storage chemical

Did not adopt	46.2 (12)	43.6 (34)	38.5 (10)	56
Adopted	53.8 (14)	56.4 (44)	61.5 (16)	74
Total	100.0 (n=26)	100.0 (n=78)	100.0 (n=26)	130

(c) The adoption of seed dressing

Did not adopt	42.3 (11)	21.8 (17)	23.1 (6)	34
Adopted	57.7 (15)	78.2 (61)	76.9 (20)	96
Total	100.0 (n=26)	100.0 (n=78)	100.0 (n=26)	130

(d) The adoption of close spacing

Did not adopt	42.3 (11)	42.3 (33)	46.2 (12)	56
Adopted	57.7 (15)	57.7 (45)	53.8 (14)	74
Total	100.0 (n=26)	100.0 (n=78)	100.0 (n=26)	130

$\chi^2 = 0.125$, not significant.

TABLE 7 (continued)

(e) The adoption of improved seed

Variety of guinea corn planted	Percent farmers adopting varieties classi- fied by years of farming experience (number in brackets)			N
	1 - 7	8 - 27	> 27	
Local only	65.4 (17)	55.7 (44)	53.8 (14)	75
Improved and local	7.7 (2)	20.3 (16)	7.7 (2)	20
Improved only	26.9 (7)	24.1 (19)	38.5 (10)	36
Total	100.0 (n=26)	100.1 (n=79)	100.0 (n=26)	131

unit.⁷ A higher proportion of the more experienced farmers adopted fertilizer, storage insecticide and seed dressing than the less experienced farmers. The differences in fertilizer use were not statistically significant. Reliable statistical conclusions could not be made about the other improved practices due to low expected cell counts.

Literacy and the adoption of improved practices. Two types of literacy were considered in relation to the adoption of recommended practices: (1) literacy in Roman and (2) literacy in Arabic script. Arabic is the medium for communicating religious ideas in the Muslim areas of northern Nigeria which includes Kano State. In recent years, limited attempts were made to disseminate improved agricultural practices using the Arabic script. Extension recommendations have traditionally been made in Roman script.

Table 8 shows the relationships between literacy and the adoption of five recommended guinea corn production practices. A higher proportion of the respondents literate in both Roman and Arabic scripts consistently adopted the recommended

⁷The problem of finding satisfactory indices for measuring variables such as farming experience in a social setting such as rural Kano should be emphasized. Had we asked respondents direct questions as to the number of years they had been farming, the probable answer would have been something like, "since I was able to walk to the farm with my father". Even the present index is not totally satisfactory. A head of household who is in a gandu association with older persons is not likely to be the head of the gandu and as such would not have authority to run the gandu farm. He would only have authority over his own gayauna farm, which is the smaller farm land assigned to subordinates by the gandu head for their personal use. The index is therefore only an approximation.

TABLE 8

RELATIONSHIP BETWEEN LITERACY AND THE ADOPTION OF
RECOMMENDED SORGHUM PRODUCTION PRACTICES AMONG A SAMPLE
OF FARMERS IN KANO STATE, NIGERIA, 1976-77

(a) Adoption of seed dressing chemical

Adoption behavior	Percent farmers by literacy class (number in brackets)			N
	Roman & Arabic	Arabic	No literacy	
Did not adopt	12.5 (4)	28.2 (24)	55.6 (10)	38
Adopted	87.5 (28)	71.8 (61)	44.4 (8)	97
Total	100.0 (n=32)	100.0 (n=85)	100.0 (n=18)	135

$x^2 = 10.560$, significant at .01 level.

(b) The adoption of close spacing

Did not adopt	30.3 (10)	42.2 (35)	66.7 (12)	57
Adopted	69.7 (23)	57.8 (48)	33.3 (6)	77
Total	100.0 (n=33)	100.0 (n=83)	100.0 (n=18)	134

$x^2 = 6.313$, significant at .05
level.

(c) The adoption of fertilizer

Did not adopt	3.0 (1)	6.4 (5)	23.5 (4)	10
Adopted	97.0 (32)	93.6 (73)	76.5 (13)	118
Total	100.0 (n=33)	100.0 (n=78)	100.0 (n=17)	128

(d) The adoption of storage chemical

Did not adopt	33.3 (11)	44.0 (37)	50.0 (9)	57
Adopted	66.7 (22)	56.0 (47)	50.0 (9)	78
Total	100.0 (n=33)	100.0 (n=84)	100.0 (n=18)	135

$x^2 = 1.630$, not significant.

TABLE 8 (continued)

(e) The adoption of improved seed

Guinea corn variety planted	Percent farmers adopting varieties classified by literacy class group (number in brackets)			N
	Roman & Arabic	Arabic	No literacy	
Local	40.6 (13)	63.5 (54)	66.7 (12)	79
Local & improved	15.6 (5)	15.3 (13)	11.1 (2)	20
Improved	43.8 (14)	21.2 (18)	22.2 (4)	36
Total	100.0 (n=32)	100.0 (n=85)	100.0 (n=18)	135

practices than the respondents literate only in Arabic scripts. Whereas, 97 percent of the respondents literate in both Roman and Arabic scripts used fertilizer in 1976-77, 94 percent of those literate in only Arabic, and 77 percent of those who had no literacy used fertilizer during the same period. The differences in the adoption of close spacing between the three classes of respondents were significant at the .05 level. Adoption of seed dressing chemical was significant at the .01 level. The adoption of improved seed showed some relationship but was not statistically significant. A higher proportion of the farmers literate in only Arabic adopted improved practices more than those that had no literacy. The rationale for these findings is the relative advantage which the more literate farmers have over the less literate in assimilating written agricultural information. As a status symbol, functional literacy can enhance the motivation to adopt recommended practices. Several researchers have reported a positive relationship between literacy and the adoption of innovations.

Social status and the adoption of recommended practices.

Two measures were used to determine social status: (1) official positions in the village, district or local government area, (ii) headship of compound. Table 9a compares the adoption behavior of respondents holding, and not holding, official positions. Table 9b compares the adoption behavior of heads, with non-heads of compounds. Both tables reveal a consistent trend. A higher proportion of the farmers who had status adopted improved practices than those who had no status. The differences

TABLE 9

INFLUENCE OF SOCIAL STATUS ON THE ADOPTION OF IMPROVED
GUINEA CORN VARIETIES AMONG A SAMPLE OF FARMERS IN
KANO STATE, NIGERIA, 1976-77

(a) Official position and the adoption of improved varieties

Variety planted	Percent farmers using varieties (number in brackets)	
	Hold no official position	Hold official position
Local variety only	63.3 (69)	39.3 (11)
Local and improved varieties	11.9 (13)	28.6 (8)
Improved variety only	24.8 (27)	32.1 (9)
Total	100.0 (n=109)	100.0 (n=28)

$\chi^2 = 6.688$, significant at .05 level.

(b) Headship of compound and the adoption of improved
varieties

Variety planted	Percent farmers using varieties (number in brackets)	
	Non-heads of compounds	Heads of compound
Local variety only	73.7 (28)	52.5 (52)
Local and improved varieties	18.4 (7)	14.1 (14)
Improved variety only	7.9 (3)	33.3 (33)
Total	100.0 (n=38)	99.9 (n=99)

$\chi^2 = 9.196$, significant at .05 level.

in the adoption of improved seed were consistently significant at the .05 level using both measures of status. Adoption of close spacing was however not significant at the .05 probability level, using headship of compound as the measure of status (chi-square = 3.383 with 1 degree of freedom). Official position as a measure of status did not show a significant relationship to the adoption of spacing. The differences in the adoption of seed dressing chemical, storage insecticide and fertilizer between the farmers with, and without status were not statistically significant, even though a higher percentage of the former group adopted the practices.

Size of farm and the adoption of recommended practices.

Labor input was used as a proxy-variable for estimating farm size. The variable was considered a more appropriate measure of farm size than acreage (or hectarage) which would not be in the farmers' frame of reference. In an effort to assess the size of respondents' farms planted to guinea corn in the preceeding year, farmers were asked the number of days it takes one man to ridge the farms by hand. The responses varied from 4 to 143 days, with a mean of 37.2 and a median of 30.5. An estimate of the data in acres was made on the basis of the work of Goddard et al. (1971) who surveyed a sample of farms in Sokoto and used the linear regression equation to establish a relationship between acreage and the number of days to prepare

upland fields for planting.⁸ The conversion showed the size of guinea corn fields in Kano State to vary from 1.04 to 28.93 acres, with a mean and median of 7.70 and 6.36, respectively.⁹ The data reflect the inequalities that exist in farm size among small scale farmers in Kano State. The incidence of rural inequalities in northern Nigeria is eloquently reported by Hill (1967) in an article titled the "Myth of the Armophous Peasantry: A Case Study in Northern Nigeria".¹⁰

Table 10 suggests that the bigger farmers are the ones that are most likely to adopt innovations, irrespective of the farming unit. Unfortunately, the incidence of small expected cell counts in contingency tables could not permit statistical conclusions to be made as to the significance of the observed differences.

The rationale for the differences in adoption behavior between small and large farm operators is well documented in the literature. Possible explanations include: (1) the

⁸Goddard, A.D., J.C. Fine and D.W. Norman. A Social-Economic Study of Three Villages in the Sokoto Close-Settled Zone: 1. Land and People. Publ. Institute for Agricultural Research, Ahmadu Bello University, Zaria (1971), page 19.

⁹The estimate is based on the linear regression equation $y = \bar{y} + bx$ where y is the size of upland field in acres; x is the number of days to prepare the field; b is the sample regression coefficient equal to 0.2007; \bar{y} is mean size of fields, a constant equal to 0.2349. The use of this equation is not intended to imply that soil physical conditions which affect tillage operations is the same in Sokoto and Kano. They may vary. Hence, these computations are only an estimate of the true acreage.

¹⁰Ibid.

TABLE 10

RELATIONSHIP BETWEEN FARM SIZE AND THE ADOPTION OF RECOMMENDED SORGHUM PRODUCTION PRACTICES
AMONG A SAMPLE OF FARMERS IN KANO STATE, NIGERIA, CLASSIFIED BY FAMILY SYSTEMS
1976-77

(a) Improved seed		Percent farmers using guinea corn variety in class of farm size (number in brackets)					
Variety of seed planted		Iyali			Gandu		
		Small sized farms (4-11 mandays)	Medium sized farms (12-64 mandays)	Large sized farms (>64 mandays)	Small sized farms (4-11 mandays)	Medium sized farms (12-64 mandays)	Large sized farms (>64 mandays)
Local only		72.2 (13)	63.6 (42)	22.2 (2)	100.0 (4)	44.8 (13)	54.5 (6)
Local and improved		11.1 (2)	12.1 (8)	22.2 (2)	0.0 (0)	27.6 (8)	9.1 (1)
Improved only		16.7 (3)	24.2 (16)	55.6 (5)	0.0 (0)	27.6 (8)	36.4 (4)
Total		100.0 (n=18)	99.9 (n=66)	100.0 (n=9)	100.0 (n=4)	100.0 (n=29)	100.0 (n=11)

TABLE 10 (continued)

(b) Fertilizer	Percent farmers using fertilizer in class of farm size (number in brackets)						
	Variety of seed planted	Iyali			Gandu		
		Small sized farms (4-11 mandays)	Medium sized farms (12-64 mandays)	Large sized farms (>64 mandays)	Small sized farms (4-11 mandays)	Medium sized farms (12-64 mandays)	Large sized farms (>64 mandays)
Did not adopt		17.3 (3)	6.5 (4)	0.0 (0)	67.7 (2)	3.6 (1)	0.0 (0)
Adopted		82.4 (14)	93.5 (58)	100.0 (8)	33.3 (1)	96.4 (27)	100.0 (11)
Total		100.0 (n=17)	100.0 (n=62)	100.0 (n=8)	100.0 (n=3)	100.0 (n=28)	100.0 (n=11)

TABLE 10 (continued)

(c) Close spacing		Percent farmers adopting close spacing in class of farm size (number in brackets)					
Adoption behavior		Iyali			Gandu		
		Small sized farms (4-11) mandays)	Medium sized farms (12-64 mandays)	Large sized farms (>64 mandays)	Small sized farms (4-11 mandays)	Medium sized farms (12-64 mandays)	Large sized farms (>64 mandays)
Did not adopt		47.1 (8)	40.0 (26)	22.2 (2)	75.0 (3)	44.8 (13)	54.5 (6)
Adopted		52.9 (9)	60.0 (39)	77.8 (7)	25.0 (1)	55.2 (16)	45.5 (5)
Total		100.0 (n=17)	100.0 (n=65)	100.0 (n=9)	100.0 (n=4)	100.0 (n=29)	100.0 (n=11)

greater access to scarce inputs and technical information which the relatively big farmers often enjoy; (2) the economic advantages which the bigger farmers have over the smaller; and (3) different orientations to profits and risk aversion between the two classes of farmers.

Size of family and the adoption of recommended practices. The differences in the adoption of fertilizer, storage insecticide, close spacing and seed dressing between ivali and gandu respondents classified by size of household were found to be very highly significant beyond the .01 probability level (Table 11b, c, d, e). Statistical conclusions could not be made about the differences in the adoption of improved seed (Table 11a) because of the incidence of low expected cell counts in the contingency table. The trend in adoption was, however, consistent with the other improved practices. The proportion of gandu respondents adopting recommended practices in the large family category (over 11 persons) was consistently higher than the proportion adopting in the average (6-11 persons) and small (2-5 persons) size families. The proportion of ivali respondents in the average size family adopting the practices was consistently higher than the proportion adopting in both the small and large family categories. A possible explanation for the reversed trend in adoption might be the advantage of labor supply which the large gandu unit has over a similar ivali unit. Moreover, there is a positive correlation between family size and farm size. An ivali family having a large acreage may not have adequate labor to manage it effectively.

TABLE 11

RELATIONSHIP BETWEEN FAMILY SIZE AND THE ADOPTION OF
RECOMMENDED GUINEA CORN PRODUCTION PRACTICES AMONG A SAMPLE
OF FARMERS IN KANO STATE, NIGERIA, CLASSIFIED BY
FAMILY SYSTEMS

(a) The adoption of improved seed

Family/work unit	Percent farmers using improved seed classified by size of household (number in brackets)			
	2 - 5	6 - 11	> 11	Total
Iyali	29.2 (7)	54.2 (13)	16.7 (4)	100.1 (n=24)
Gandu	0.0 (0)	33.3 (4)	66.7 (8)	100.0 (n=12)
Total	7	17	12	36

(b) The adoption of seed dressing

Iyali	29.7 (19)	54.7 (35)	15.6 (10)	100.0 (n=64)
Gandu	0.0 (0)	25.0 (8)	75.0 (24)	100.0 (n=32)
Total	19	43	34	96

$x^2 = 34.933$, significant at .01 level.

(c) The adoption of close spacing

Iyali	38.9 (21)	44.4 (24)	16.7 (9)	100.0 (n=54)
Gandu	0.0 (0)	36.4 (8)	63.6 (14)	100.0 (n=22)
Total	21	32	23	76

$x^2 = 20.192$, significant at .01 level.

(d) The adoption of fertilizer

Iyali	35.4 (28)	46.8 (37)	17.7 (14)	99.9 (n=79)
Gandu	2.6 (1)	30.8 (12)	66.7 (26)	100.1 (n=39)
Total	29	49	40	118

$x^2 = 31.560$, significant at .01 level.

TABLE 11 (continued)

(e) The adoption of storage insecticide

Family/work unit	Percent farmers using improved seed classified by size of household (number in brackets)			
	2 - 5	6 - 11	> 11	Total
Iyali	30.0 (15)	52.0 (26)	18.0 (9)	100.0 (n=50)
Gandu	3.7 (1)	29.6 (8)	66.7 (18)	100.0 (n=27)
Total	16	34	27	77

 $\chi^2 = 19.664$, significant at .01 level.

There might also be differences in orientation to risk aversion among farmers having varying family sizes and labor force.

Family labor force and the adoption of recommended practices. The adoption of the improved practices recommended for guinea corn production requires additional labor input. Forty-five percent of the farmers interviewed did not have adequate labor to operate their farms in 1976-77, hence the need to assess the possible effect of family labor on the adoption of recommended practices.

Two measures of the relative strength of labor force were used: (i) quantitative - the numerical strength of the family labor force, (ii) qualitative - whether or not the respondent had adequate labor for farm operations the previous year. The problem of using the first measurement as a basis for assessing behavior has been mentioned in an earlier section. Numerical strength does not, per se, imply adequacy of labor. The qualitative data were, therefore, used in the analysis (Table 12). The data suggest that there were no real differences in the adoption behavior of farmers who had adequate labor and those who had inadequate labor during the season. The implication of this finding, which is contrary to the expectations generated by the literature, is that the adoption of sorghum production practices would not be constrained by labor shortage. The present finding is rational, considering farmers' perception of the labor requirements for the adoption of recommended practices. Forty-eight percent (60) of the interviewees thought that the traditional system of producing

TABLE 12

RELATIONSHIP BETWEEN FAMILY LABOR FORCE AND THE ADOPTION OF
RECOMMENDED SORGHUM PRODUCTION PRACTICES AMONG A SAMPLE
OF FARMERS IN KANO STATE, NIGERIA, 1976-77

(a) Improved seed

Variety of sorghum planted	Percent farmers planting variety classified by labor force (number in brackets)	
	Inadequate	Adequate
Local only	58.1 (36)	58.7 (44)
Local & improved	9.7 (6)	20.0 (15)
Improved only	32.3 (20)	21.3 (16)
Total	100.1 (n=62)	100.0 (n=75)

$\chi^2 = 3.903$, not significant.

(b) The adoption of close spacing

Adoption behavior	Percent farmers classified by strength of family labor force (number in brackets)	
	Inadequate	Adequate
Did not adopt	50.0 (31)	36.5 (27)
Adopted	50.0 (31)	63.5 (47)
Total	100.0 (n=62)	100.0 (n=74)

$\chi^2 = 1.997$, not significant.

(c) The adoption of fertilizer

Did not adopt	6.8 (4)	8.5 (6)
Adopted	93.2 (55)	91.5 (65)
Total	100.0 (n=59)	100.0 (n=71)

guinea corn requires more labor input than the modern system using improved practices, 46 percent thought otherwise, and 6 percent expressed no opinion. It appears from Table 13 that when labor was a constraint, weeding, and to a lesser degree, land preparation were given the least attention by farmers.

TABLE 13

FARMING PRACTICES MENTIONED BY FARMERS AS HAVING
SUFFERED AS A RESULT OF LABOR SHORTAGE*, 1976-77
CROP SEASON

Farming practice	Number of times mentioned	Percentage of total
Weeding	41	55
Land preparation	16	21
Timely harvesting	13	17
Timely planting	5	7
Total	75	100

*Some respondents mentioned more than one farming practice.

Off-farm occupations and the adoption of recommended practices. The respondents having off-farm occupations were compared with those without off-farm occupations in order to assess the possible role of occupations on adoption behavior. Off-farm pursuits generate additional income for the farmer,

TABLE 14

RELATIONSHIP BETWEEN OFF-FARM OCCUPATIONS AND THE ADOPTION OF
RECOMMENDED SORGHUM PRODUCTION PRACTICES AMONG A SAMPLE OF
FARMERS IN KANO STATE OF NIGERIA

(a) The adoption of improved seed

Variety of seed planted	Percent farmers (number in brackets)		N
	Off-farm occupation	No off-farm occupation	
Local variety	55.9 (22)	63.6 (28)	50
Local and improved varieties	17.2 (16)	11.4 (5)	21
Improved variety	26.9 (25)	25.0 (11)	36
Total	100.0 (n=63)	100.0 (n=44)	107

$x^2 = 1.010$, not significant.

(b) The adoption of fertilizer

Adoption behavior	Percent farmers (number in brackets)		N
	No off-farm occupation	Off-farm occupation	
Did not adopt	7.9 (7)	7.3 (3)	10
Adopted	92.1 (82)	92.7 (38)	120
Total	100.0 (n=89)	100.0 (n=41)	130

(c) The adoption of seed dressing

Did not adopt	25.5 (24)	33.3 (14)	38
Adopted	74.5 (70)	66.7 (28)	98
Total	100.0 (n=94)	100.0 (n=42)	136

$x^2 = 0.533$, not significant.

thereby enhancing his ability to purchase inputs and hire labor. The relatively better-off farmer might be more inclined than the worse-off farmer to adopt innovations involving risks and uncertainties. On the other hand, it could be argued that off-farm occupations distract farmers from their primary occupation, making them less receptive to new farming ideas. Table 14 suggests that off-farm occupations, per se, do not influence the adoption behavior of farmers. What appears to be important is the seasonality, or time devoted to off-farm occupations.

Irrespective of the structure of the farming unit, the proportion of respondents with year-round off-farm occupation adopting the recommended practices is considerably higher than the proportion with seasonal occupations. The proportion of gandu respondents with year-round occupations adopting the practices is consistently higher than the proportion of iyali respondents adopting in the same category of occupations. In the case of improved seed, the difference is significant at the .01 level. Fertilizer, seed dressing chemical and storage insecticide showed significant differences at the .05 level. The difference in the adoption of close spacing were not statistically significant (Table 15).

Ox-plow utilization and the adoption of recommended practices. Fifty-seven percent of the farmers interviewed used ox plow in their farm operations in 1976-77. The difference in the adoption behavior of the farmers that used ox-plow and their counterparts who did not use ox-plow was not statistically significant. Similar comparison could not be made in respect

TABLE 15

RELATIONSHIP BETWEEN SEASONALITY IN OFF-FARM OCCUPATION
AND THE ADOPTION OF RECOMMENDED SORGHUM PRODUCTION PRACTICES
AMONG A SAMPLE OF FARMERS IN KANO STATE, NIGERIA, CLASSIFIED
BY FAMILY SYSTEMS, 1976-77

(a) The adoption of fertilizer

Seasonality	Percent farmers adopting in family units (number in brackets)		N
	Iyali	Gandu	
Year-round	65.5 (36)	92.9 (26)	62
Dry season only	34.5 (19)	7.1 (2)	21
Total	100.0 (n=55)	100.0 (n=28)	83

$\chi^2 = 5.993$, significant at .05 level.

(b) The adoption of improved varieties

Year-round	33.3 (6)	88.9 (8)	14
Dry season only	66.7 (12)	11.1 (1)	13
Total	100.0 (n=18)	100.0 (n=9)	27

Fisher's Exact Test = 0.009, significant at .01 level.

(c) The adoption of storage insecticide

Year-round	55.9 (19)	90.9 (20)	39
Dry season only	44.1 (15)	9.1 (2)	17
Total	100.0 (n=34)	100.0 (n=22)	56

$\chi^2 = 6.183$, significant at .05 level.

(d) The adoption of seed dressing

Year-round	60.9 (28)	91.7 (22)	50
Dry season only	39.1 (18)	8.3 (2)	20
Total	100.0 (n=46)	100.0 (n=24)	70

$\chi^2 = 5.898$, significant at .05 level.

TABLE 15 (continued)

(e) The adoption of close spacing

Seasonality	Percent farmers adoption in family units (number in brackets)		N
	Iyali	Gandu	
Year-round	59.0 (23)	88.2 (15)	38
Dry season only	41.0 (16)	11.8 (2)	18
Total	100.0 (n=39)	100.0 (n=27)	56

$\chi^2 = 3.402$, not significant.

of tractor use. Only 9 farmers out of the total sample of 138 used the tractor hire service in 1976-77.

Use of credit and the adoption of recommended practices.

As pointed out earlier, there are no formal credit facilities for the farmers participating in the NAFPP. Most farmers who used credit obtained it from non-institutional sources, of which family members accounted for 57 percent, followed by the local money lenders (19 percent) (Table 15).

TABLE 16
SOURCES OF FARM CREDIT USED BY A SAMPLE OF FARMERS
IN KANO STATE, NIGERIA, 1976-77

Source	Percent farmers obtaining credit from source (number in brackets)
Family member	56.9 (33)
Local money lender	19.0 (11)
Cooperative Society	10.3 (6)
Other	13.8 (8)
Total	100.0 (n=58)

Expenditure of farm credit. Respondents were asked of the major items on which they spent the credit they received in 1976-77. Most of the respondents (61 percent) spent the credit hiring labor (Table 17). It is interesting to note that farm inputs (fertilizer and seed) accounted for 20 percent of the

TABLE 17

EXPENDITURE OF FARM CREDIT BY A SAMPLE OF FARMERS
IN KANO STATE, NIGERIA, 1976-77

Item of expenditure	Number of times mentioned as percent total items (number in brackets)
Hiring labor	60.9 (42)
Fertilizer	11.6 (8)
Seed	8.7 (6)
Farm tools	4.3 (3)
Family needs	4.3 (3)
Tractor hire	2.9 (2)
Other items	7.2 (5)
Total	99.9 (69)*

*Some respondents mentioned more than one main item of expenditure.

total expenditure.

The relationship between farm credit and adoption of recommended practices was assessed by comparing the adoption behavior of the respondents using credit with those who did not use credit (Table 18). In percentage terms, the respondents who received credit adopted improved practices more than those who did not use credit. The difference was statistically significant at the .01 level for seed dressing chemical and at the .05 probability level for improved seed. The differences in the adoption of spacing and storage insecticide were not

TABLE 18

USE OF CREDIT AND THE ADOPTION OF RECOMMENDED SORGHUM PRODUCTION PRACTICES AMONG A SAMPLE OF FARMERS IN KANO STATE, NIGERIA, 1976-77 CROP SEASON

Credit status	Percent of farmers adopting (number in brackets)					
	Seed dressing		Close spacing		Fertilizer	
	Did not adopt	Adopted	Did not adopt	Adopted	Did not adopt	Adopted
No credit	41.0 (34)	8.0 (4)	46.1 (37)	38.5 (20)	11.3 (9)	2.1 (1)
Credit	59.0 (49)	92.0 (46)	54.9 (45)	61.5 (32)	88.8 (71)	97.9 (47)
Total	100.0 (n=83)	100.0 (n=50)	100.0 (n=82)	100.0 (n=52)	100.0 (n=80)	100.0 (n=48)

$$x^2 = 15.038$$

$$x^2 = 0.337$$

No x^2 test.

$$x^2 = 0.027$$

Significant at .01 level.

Not significant.

Not significant.

TABLE 18 (continued)

(b) Use of credit and the adoption of improved varieties				
Credit status	Percent farmers adopting varieties (number in brackets)			Total
	Local varieties	Local and improved varieties	Improved varieties	
No credit	67.1 (55)	13.4 (11)	19.5 (16)	100.0 (n=82)
Credit	44.2 (23)	17.3 (9)	38.5 (20)	100.0 (n=52)
$\chi^2 = 7.429$		Significant at .05 level.		

significant. Reliable statistical conclusions could not be made in respect to fertilizer use because of the small expected cell frequency in the contingency table. These data appear to suggest that a properly designed and administered credit program could enhance the adoption of recommended practices.

Agricultural Extension Agent/Farmer Contact and the Adoption of Recommended Practices

Common belief holds that the ratio of extension agents to farmers in Nigeria is too low to induce the preponderance of the farming population to adopt improved agricultural practices and raise food production. Extension agent/farmer contact and the adoption by farmers of improved agricultural technologies are positively related. In this section an assessment of extension agent/farmer contact is made to determine if the strategy of "intensive contact" adopted by the NAFPP is having the desired objective of inducing clientele acceptance of improved practices. Two null hypotheses were developed: (1) that there is no relationship between extension agent/farmer contact and the adoption by farmers of guinea corn production practices; (2) that NAFPP field programs have not enhanced farmers' motivation to adopt improved guinea corn production practices.

Extension contact was operationally defined to mean:

1. extension agent visits to farmers' guinea corn fields;
2. farmers seeking information from extension agents

to improve guinea corn production;

3. exposure of farmers to field demonstrations in terms of (a) seeing extension guinea corn result demonstration, mini-kit, or production kit plots; (b) serving as a cooperator for field demonstration in terms of having a field demonstration sited on one's farm. Enhanced motivation was defined in terms of changed behavior: change to the recommended practices for guinea corn production.

Extension Agent Farm Visitation and the Adoption of Recommended Practices

In order to determine if a relationship existed between the frequency of extension agents' visits to farms and the adoption by farmers of recommended practices, respondents were pooled into three categories on the basis of the number of visits extension agents had made to their guinea corn farms and their adoption behavior during the 1976-77 crop season was compared (Table 19).¹¹ The data indicate a strong relationship between the promotional visits of extension agents and the adoption of recommended practices by farmers. The farmers

¹¹The three categories are as follows:

(1) Low frequency consisting of (a) the farmers whose guinea corn fields have never been visited by an extension agent, (b) farmers whose guinea corn fields were visited last by an extension agent two or more years before the interview.

(2) Medium frequency - consisting of farmers whose guinea corn fields were visited 1-3 times the year preceeding the interview (that is 1976-77 crop season).

(3) High frequency - consisting of farmers whose guinea corn fields were visited by an extension agent more than 3 times in the year preceeding the interview. The number of visits in this category varied from 4 to 20, implying monthly to weekly visits throughout the growing period of the crop.

TABLE 19
 RELATIONSHIP BETWEEN EXTENSION AGENT VISITS TO FARMS AND THE ADOPTION OF
 RECOMMENDED SORGHUM PRODUCTION PRACTICES AMONG A SAMPLE OF FARMERS IN
 KANO STATE, NIGERIA, 1976-77 CROP SEASON

Adoption behavior	Farmers adopting practice classified by frequency of agent visits (number in brackets)					
	Seed dressing			Fertilizer		
	Low frequency	Medium frequency	High frequency	Low frequency	Medium frequency	High frequency
Did not adopt	42.5 (31)	3.6 (1)	17.1 (6)	14.3 (10)	0.0 (0)	0.0 (0)
Adopted	57.5 (42)	96.4 (27)	82.9 (29)	85.7 (60)	100.0 (28)	100.0 (32)
Total	100.0 (n=73)	100.0 (n=28)	100.0 (n=35)	100.0 (n=70)	100.0 (n=28)	100.0 (n=32)

$$x^2 = 17.935$$

No chi-square test

Significant at .01 level.

TABLE 19 (continued)

Adoption behavior	Farmers adopting practice classified by frequency of agent visits (number in brackets)					
	Storage chemical			Close spacing		
	Low frequency	Medium frequency	High frequency	Low frequency	Medium frequency	High frequency
Did not adopt	54.1 (40)	27.6 (8)	29.6 (10)	61.6 (45)	10.3 (3)	29.4 (10)
Adopted	45.9 (34)	72.4 (21)	70.6 (24)	38.4 (28)	89.7 (26)	70.6 (24)
Total	100.0 (n=74)	100.0 (n=29)	100.0 (n=34)	100.0 (n=73)	100.0 (n=29)	100.0 (n=34)

$$\chi^2 = 9.073$$

Significant at .05 level.

$$\chi^2 = 25.577$$

Significant at .01 level.

TABLE 19 (continued)

Variety planted	Farmers adopting varieties classi- fied by frequency of agent visit (number in brackets)		
	Low frequency	Medium frequency	High frequency
Local variety	86.3 (63)	27.6 (8)	25.7 (9)
Local and improved varieties	1.4 (1)	31.0 (9)	31.4 (11)
Improved variety	12.3 (9)	41.4 (12)	42.9 (15)
Total	100.0 (n=73)	100.0 (n=29)	100.0 (n=35)

having higher frequencies of visits tended to adopt improved practices more than those having low frequencies. The differences in the adoption of seed dressing chemical, storage insecticide and close spacing between the three categories of respondents were highly significant. Statistical conclusions could not be made in respect of fertilizer and improved varieties, which had low cell counts. Additional research would be needed to determine the optimum level of contact that will enhance adoption and still allow extension agents time to visit more farms.

Adoption Behavior of Farmers Seeking Advice from Extension Agents

The adoption behavior of the farmers who had sought advice from extension agents on guinea corn improvement was strikingly different from their counterparts who had not sought advice (Table 20). A consistently higher proportion of the farmers seeking advice from extension agents adopted the recommended practices compared to farmers who had not sought advice. The differences between the two categories of respondents in the adoption of improved seed, seed dressing chemical, close spacing and storage chemicals were significant at the .01 probability level. The data for fertilizer adoption could not be analyzed using the chi-square statistic because of low expected cell counts. Two possible reasons are advanced to explain the differences in adoption between the two classes of farmers: (1) the supply function of extension agents - in

TABLE 20

ADOPTION BEHAVIOR OF A SAMPLE OF FARMERS IN KANO STATE,
NIGERIA SEEKING EXTENSION AGENT ADVICE ON SORGHUM
PRODUCTION, 1976-77 CROP SEASON

Adoption behavior	Percent respondents adopting practices classified by activity (seeking advice) (number in brackets)			
	Seed dressing		Fertilizer	
	Did not seek advice	Sought advice	Did not seek advice	Sought advice
Did not adopt	47.6 (30)	7.2 (5)	13.3 (8)	1.5 (1)
Adopted	52.4 (33)	92.8 (64)	86.7 (52)	98.5 (65)
Total	100.0 (n=63)	100.0 (n=69)	100.0 (n=60)	100.0 (n=60)

$x^2 = 25.515$
Significant at .01 level.

Adoption behavior	Percent respondents adopting practices classified by activity (seeking advice) (number in brackets)			
	Storage chemical		Close spacing	
	Did not seek advice	Sought advice	Did not seek advice	Sought advice
Did not adopt	60.3 (38)	25.7 (18)	67.7 (42)	21.4 (15)
Adopted	39.7 (25)	74.3 (52)	32.3 (20)	78.6 (55)
Total	100.0 (n=63)	100.0 (n=70)	100.0 (n=62)	100.0 (n=70)

$x^2 = 14.898$
Significant at .01
level.

$x^2 = 26.887$
Significant at .01
level.

TABLE 20 (continued)

Variety of guinea corn planted	Respondents adopting seed type classified by activity (number in brackets)	
	Did not seek advice	Sought advice
Local variety only	85.7 (54)	31.4 (22)
Local and improved varieties	6.3 (4)	24.3 (17)
Improved variety only	7.9 (5)	44.3 (31)
Total	99.0 (n=63)	100.0 (n=20)

 $\chi^2 - 40.042$

Significant at .01 level.

addition to providing technical advice and being supportive in decisions involving risks and uncertainties, extension agents are likely to supply the farmers seeking their advice with the inputs necessary to put the advice into practice; (2) the personality orientation of the small scale farmer who seeks out the extension agent - the farmer that is agent-oriented is likely to be similar to the agent in several respects; he is likely to be an opinion leader, has social status within the community, probably venturesome and well-motivated to modernize his farming practices. The average farmer is likely to wait for the extension agent rather than go to the agent for advice.

Farmer Exposure to Field Demonstrations and the Adoption of Recommended Practices

The percentage of farmers that had exposure to the production kit plot was higher than the percentages that had exposure to the guinea corn demonstration plot and the mini-kit plot (Table 21). The production kit was the latest of the three types of demonstrations to be introduced into the area. The phenomenon might reflect an observable advantage or greater promotion of the production kit. The conventional extension guinea corn demonstration is probably as old in the area as extension service itself. Notwithstanding, one-fifth of all interviewees said they had not seen the extension guinea corn plot previously.

An attempt was made to assess the effectiveness of field demonstrations in inducing change by comparing the adoption behavior of the farmers who had seen, or taken part

TABLE 21

PERCENTAGE OF FARMERS WHO HAD SEEN OR TAKEN PART IN FIELD
DEMONSTRATIONS, KANO STATE, NIGERIA, 1976-77

	Type of Demonstration		
	Extension Guinea Corn Demonstration	Guinea Corn Mini-kit Plot	Guinea Corn Production Kit Plot
Have seen	79 (109)	66 (90)	80 (110)
Have not seen	21 (29)	34 (47)	19 (26)
Total	100.0 (n=138)	100.0 (n=137)	100.0 (n=136)
Cooperators	20 (27)	15 (20)	13 (18)
Non-cooperators	80 (111)	85 (115)	87 (119)
Total	100.0 (n=138)	100.0 (n=135)	100.0 (n=137)

in field demonstrations as cooperators, with the farmers who had not. Field demonstrations and interpersonal extension agent/farmer face-to-face contact are the principal extension teaching methods in the region. "Seeing" a demonstration plot in this context is not a passive experience. It stimulates interest and often leads to greater interaction between the cooperator and the farmers who have not participated as cooperators, and between both categories of farmers and the village extension agent.

Deliberate promotional activities are also planned by agents to expose farmers to field demonstrations.¹² An estimated 1250-1450 farmers attended field days and tours organized in connection with the mini-kit and production kit programs in Kano State during the 1975-76 season.¹³ The data show that the farmers who have been exposed to field demonstrations adopt recommended practices more than those without similar exposure (Table 22). The differences in the adoption of seed dressing chemicals and close spacing between the two categories of respondents were significant at the .01 probability level, in respect of all 3 types of demonstrations. Although the adoption of improved seed and chemical fertilizer by the two

¹²The demonstrations are the extension guinea corn result demonstration, the mini-kit plot and the production kit plot. The mini-kit is regarded in this thesis as a demonstration, for the purpose of brevity. Its dual use as an extension teaching and research tool are appreciated.

¹³Rufa'i, A. National Accelerated Food Production Project NAFPP 1975-76 Annual Report of Kano State Wheat, Sorghum, Millet Project, (mimeo, page 31).

TABLE 22

FARMER EXPOSURE TO EXTENSION FIELD DEMONSTRATIONS AND THE
ADOPTION OF RECOMMENDED GUINEA CORN PRODUCTION PRACTICES
IN KANO STATE, NIGERIA, 1976-77 CROP SEASON

(a) Exposure to guinea corn extension demonstration plots and the adoption of recommended practices.

Exposure to extension demonstration plots	Percent farmers (number in brackets)			
	Seed dressing		Fertilizer	
	Not adopted	Adopted	Not adopted	Adopted
No	58.6 (17)	19.6 (21)	14.3 (4)	5.9 (6)
Yes	41.4 (12)	80.4 (86)	85.7 (24)	94.1 (96)
Total	100.0 (n=29)	100.0 (n=109)	100.0 (n=28)	100.0 (n=102)
	$x^2 = 15.349$ Significant at .01 level.		No x^2 test.	

Exposure to extension demonstration plots	Percent farmers (number in brackets)			
	Storage insecticide		Close spacing	
	Not adopted	Adopted	Not adopted	Adopted
Not exposed	79.3 (23)	32.4 (35)	78.6 (22)	33.3 (6)
Exposed	20.7 (6)	67.6 (75)	21.4 (6)	66.7 (72)
Total	100.0 (n=29)	100.0 (n=108)	100.0 (n=28)	100.0 (n=78)
	$x^2 = 18.724$ Significant at .01 level.		$x^2 = 16.800$ Significant at .01 level.	

TABLE 22 (continued)

(b) Exposure to guinea corn mini-kit plots and the adoption of recommended practices

Exposure to mini-kit plots	Percent farmers (number in brackets)			
	Seed dressing		Fertilizer	
	Not adopted	Adopted	Not adopted	Adopted
No	45.7 (21)	18.0 (16)	15.6 (7)	3.6 (3)
Yes	54.3 (25)	82.0 (73)	84.4 (38)	96.4 (81)
Total	100.0 (n=46)	100.0 (n=89)	100.0 (n=45)	100.0 (n=84)

$$x^2 = 10.324$$

Significant at .01 level.

No x^2 test.

Exposure to mini-kit plots	Percent farmers (number in brackets)			
	Storage chemical		Close spacing	
	Not adopted	Adopted	Not adopted	Adopted
No	61.7 (29)	31.5 (28)	68.1 (32)	28.4 (25)
Yes	38.3 (18)	68.5 (61)	31.9 (15)	71.6 (63)
Total	100.0 (n=47)	100.0 (n=89)	100.0 (n=47)	100.0 (n=88)

$$x^2 = 10.345$$

Significant at .01 level.

$$x^2 = 18.177$$

Significant at .01 level.

TABLE 22 (continued)

(c) Exposure to guinea corn production kits and the adoption of recommended practice

Exposure to production kit plots	Percent farmers (number in brackets)			
	Seed dressing		Fertilizer	
	Not adopted	Adopted	Not adopted	Adopted
No	61.5 (16)	19.4 (21)	16.0 (4)	4.9 (5)
Yes	38.5 (10)	80.6 (87)	84.0 (21)	95.1 (98)
Total	100.0 (n=26)	100.0 (n=108)	100.0 (n=25)	100.0 (n=103)
$x^2 = 16.530$		No x^2 test.		
Significant at .01 level.				

Exposure to production kit plots	Percent farmers (number in brackets)			
	Storage chemical		Close spacing	
	Not adopted	Adopted	Not adopted	Adopted
No	50.0 (13)	39.4 (43)	69.2 (18)	35.2 (38)
Yes	50.0 (13)	60.6 (66)	30.8 (8)	64.9 (70)
Total	100.0 (n=26)	100.0 (n=109)	100.0 (n=26)	100.0 (n=108)
$x^2 = 0.577$ n.s.		$x^2 = 8.634$		
Not significant.		Significant at .01 level.		

TABLE 22 (continued)

(d) Exposure to field demonstrations, by type, and the adoption of improved varieties

Variety of guinea corn planted	Percent respondents using improved varieties fall- ing in each class of field demonstration (number in brackets)			
	Extension guinea corn demonstration plot		Guinea corn mini-kit	
	Not exposed	Exposed	Not exposed	Exposed
Local variety only	89.7 (26)	50.0 (54)	76.1 (35)	48.9 (44)
Local and improved varieties	6.9 (2)	17.6 (19)	10.9 (5)	17.8 (16)
Improved variety only	3.4 (1)	32.4 (35)	13.0 (6)	33.3 (30)
Total	100.0 (n=29)	100.0 (n=108)	100.0 (n=46)	100.0 (n=90)
No x^2 test.			$x^2 = 9.552$, Significant at .01 level.	

(d) continued)

Variety of guinea corn planted	Guinea corn production kit plot	
	Not exposed	Exposed
Local variety only	76.0 (19)	53.6 (59)
Local and improved varieties	4.0 (1)	18.2 (20)
Improved variety only	20.0 (5)	28.2 (31)
Total	100.0 (n=25)	100.0 (n=110)
No x^2 test.		

classes of respondents followed trends similar to the other recommended practices, statistical conclusions could not be made because of the incidence of low expected cell counts. The mini-kit plot had effects similar to the result demonstration in inducing behavior change: the differences in the adoption of seed dressing, storage insecticides, close spacing, and improved seed between the respondents that had been exposed to the mini-kit and those that had not been exposed to it were highly significant. Statistical conclusions could not be made about the observed differences in fertilizer use. Statistical conclusions could not be made in respect of the effect of the production kit on fertilizer and improved varieties acceptance using the chi-square statistic. It is important to note that these data do not necessarily imply superiority of any one type of demonstration over the others. Most respondents had seen or participated in two or all three types of demonstrations. It is likely that the learning experiences acquired from one type of demonstration were reinforced by the other demonstrations. The conclusion that can be safely drawn from the data is that the three types of demonstrations are effective extension teaching tools.

Farmer Perception of the Relative Effectiveness of Field Demonstrations

Respondents were asked which of the field demonstrations

they considered most helpful in encouraging them to adopt new farming ideas. The majority of farmers did not perceive the three types of demonstrations differently (Table 23). Of the 129 responding farmers, 44 percent felt that the extension guinea corn result demonstration, the mini-kit plot and the production kit plot were equally effective in inducing adoption

TABLE 23

RATING OF THE RELATIVE EFFECTIVENESS OF THREE TYPES OF
FIELD DEMONSTRATIONS BY A SAMPLE OF FARMERS
IN KANO STATE, NIGERIA

Demonstration	Percent respondents rating demonstrations as most effective (number in brackets)
Extension demonstration, mini-kit and production kit equally effective	44.2 (57)
Extension guinea corn demonstration plot	16.3 (21)
NAFPP Production kit plot	16.3 (21)
NAFPP Mini-kit plot	8.5 (11)
Extension guinea corn demonstration and NAFPP production kit plots equally effective	6.2 (8)
NAFPP mini-kit and production kit plots equally effective	3.9 (5)
Don't know (not certain)	4.7 (6)
Total	100.1 (n=129)

of recommended practices.

Only 9 percent of the farmers rated the mini-kit plot the most effective, compared to 16 percent who rated the production kit and extension demonstration plot the most effective.

Table 24 summarizes the reasons on which the ratings were based. Most farmers based their rating on the ability of the particular demonstration to project the advantage of improved practices. Profitability and general advantage (presumably agronomic) were mentioned by approximately two-thirds of the respondents. Slightly less than one-fifth based their

TABLE 24
REASONS GIVEN BY FARMERS FOR RATING DEMONSTRATION
MOST EFFECTIVE

Reasons for rating	Percent respondents giving reason (number in brackets)
I was able to observe the advantages of the practices demonstrated	46.9 (30)
The demonstration was located on my farm	17.2 (11)
I participated and learned how to carry out the practices	12.5 (8)
The package appeared profitable	10.9 (7)
The practices were easy to follow	6.3 (4)
Others	6.3 (4)
Total	100.1 (n=64)

decision on location. Locating a demonstration in a farmer's field enhances the opportunity to learn the practices and to observe the results more closely. It might also enhance the farmer's self esteem as well as his esteem in the eyes of other people in the community. The learning opportunity which the demonstration afforded the farmers was mentioned by approximately one out of ten farmers.

It does not appear that the low rating of the mini-kit reflects its lack of effectiveness in inducing change. When the farmers that had seen or taken part in the various demonstrations were asked how helpful each demonstration had been in encouraging them to adopt improved guinea corn production practices, 92 percent (84) rated the mini-kit "very effective", compared to 91 percent (96) and 92 percent (101) who rated the extension guinea corn and the production kit "very effective", respectively (Table 25). A possible explanation for the relatively low rating of the effectiveness of the mini-kit in comparison with the other demonstrations might be lack of outstanding differences between the varieties in the mini-kit. The strength of the variety mini-kit lies in the relative advantages which improved plant types have over the varieties they are intended to replace. It appears that the variety that can make "dramatic" impact over local varieties is lacking

TABLE 25

FARMER PERCEPTION OF THE EFFECTIVENESS OF THREE TYPES OF FIELD DEMONSTRATIONS
IN INDUCING ADOPTION OF RECOMMENDED PRACTICES

Field demonstration (type)	Respondents expressing opinions - percent (number in brackets)			Base N
	Very effective	Somewhat effective	Not certain (don't know)	
Extension guinea corn demon- stration	90.6 (96)	6.6 (7)	2.8 (3)	100.0 (106)
NAFPP guinea corn mini-kit	92.3 (84)	4.4 (4)	3.3 (3)	100.0 (91)
NAFPP guinea corn production kit	91.8 (101)	4.5 (5)	3.6 (4)	99.9 (110)

in the present mini-kit.¹⁴

Adoption, Discontinuance and Rejection of Recommended Practices

This section is intended to look into the specific objectives of the study which were not covered by the hypotheses tested in the preceeding sections. In particular, it is intended to assess the extent of adoption and discontinuance of recommended practices and to seek explanation for such behavior.

Innovation acceptance. In an effort to assess the extent of adoption of the improved practices being promoted in field demonstrations, the farmers were asked of the improved practices they had used to produce guinea corn. It appears from Table 26 that there are wide differences in the adoption of improved practices by farmers in Kano State. Fertilizer appears to be the most widely accepted innovation. Monocropping appears to be the least acceptable of the innovations. Whereas, nine out of ten farmers interviewed had used fertilizer only

¹⁴None of the varieties which our team saw in mini-kit plots in Kano State during the course of our field work showed outstanding observable qualities in relation to the other varieties. In fact, the interviewers who had not seen mini-kit plots previously openly expressed disappointment at the performance of the "improved varieties". An editorial in the extension newsletter published by the Agricultural Extension and Research Liason Service of Ahmadu Bello University (Volume 3, No. 1, January 1977) has mentioned "the apparent half-hearted acceptance of the so-called improved variety" This thesis contains a photograph of a typical guinea corn production kit in Kano State (Plate 1). The variety that is planted in the production kit is supposed to be the best variety from the mini-kit program.

TABLE 26

ADOPTION OF RECOMMENDED SORGHUM PRODUCTION PRACTICES AMONG
A SAMPLE OF FARMERS, KANO STATE, NIGERIA

Recommended practice	Farmers adopting practice	
	As percentage of total sample (number in brackets)	On all farm(s) as percentage of farmers adopting (number in brackets)
Time of planting	44.9 (62)	83.3 (55)
Improved seed	37.7 (52)	82.0 (41)
Seed dressing	70.3 (97)	84.5 (82)
Seed rate	13.8 (19)	81.7 (5)
Close spacing	51.4 (71)	81.7 (58)
Fertilizer	87.0 (120)	85.5 (106)
Weed control	39.1 (54)	n.a.*
Storage insecticide	42.8 (59)	n.a.*
Monocropping	10.9 (15)	56.3 (9)
Thinning	39.9 (55)	81.8 (45)
No practice adopted	6.5 (9)	n.a.*

*See "Abbreviations", p. 25, for explanation of symbols.



PLATE I: A SORGHUM PRODUCTION KIT PLOT IN KANO STATE, NIGERIA.



PLATE II: A DWARF VARIETY OF SORGHUM IN A FARMER'S FIELD IN KANO STATE, NIGERIA.

one out of ten had produced guinea corn in sole stands. Since the research instrument was not designed to assess the dosage of fertilizer used by farmers, it was not possible to determine if the optimum dosage recommended for guinea corn production was being used. Approximately nine out of ten farmers adopting fertilizer, applied it to their entire guinea corn farm or farms. The definition of "adoption" often found in the literature appears inadequate in the present context where the full use of divisible inputs such as fertilizer is constrained not by lack of conviction on the part of the farmer, but by physical limitations in supplies.¹⁵ It would not be appropriate to categorize the 14 percent of farmers who did not use fertilizer on their entire guinea corn farm (or farms) in the "trial stage" of the adoption process. Constrained by inadequate supplies of fertilizer, the well-informed farmer is likely to apply the available amount to a limited portion of his field rather than spread it too thin to obtain returns on his labor and capital investments.

Although farmers generally use lower seed rates than recommended, the level of adoption of seed rate implied in these data may imply a communication problem. It is difficult to convey the meaning of "seed rate" to farmers, since land measurement in acres (or hectares) and weight measurement in

¹⁵Rogers (1962), *Ibid.*, page 86; defines adoption stage as the period when "the individual decides to continue the full use of the innovation" and gives the example of the farmer "who planted his total corn acreage in hybrid seed."

pounds (or kilograms) is not in their frame of reference. It is interesting to note that only 7 percent of the farmers interviewed have not used any improved practices previously.

Discontinuance of innovations. The incidence of discontinuance of accepted innovations does not appear to be a common phenomenon among Kano farmers (Table 27). The reason for the discontinuance of fertilizer use given by two farmers implies frustration over supply problems rather than dissatisfaction with fertilizer as an innovation. The reasons given by farmers for discontinuing the use of the various practices are listed:

Fertilizer: not available when needed.

Close spacing: heads of close-spaced sorghum too small; yield not dependable;

Improved seed: matured too early, was bitten by rain and turned mouldy in the field;

Time of planting: too early for onset of rainfall to be established, leads to seed loss; and

Seed dressing: not the best way to treat seed.

Adoption of improved seed. Approximately six out of ten farmers interviewed planted local seed in 1976-77, compared to three who planted improved, and two who planted both improved and local varieties. Approximately seven out of ten farmers who planted improved variety knew the name of the variety. The majority of farmers mentioned Yar Gunki. None of the other varieties in the 1976-77 mini-kit and production kit programs was mentioned, inspite of reports that "High

TABLE 27

DISCONTINUANCE OF RECOMMENDED SORGHUM PRODUCTION PRACTICES
AMONG A SAMPLE OF FARMERS IN KANO STATE, NIGERIA

Practice	Farmers discontinuing practice as percent of total sample (number in brackets)
Improved seed	1.4 (2)
Fertilizer	1.4 (2)
Close spacing	1.4 (2)
Time of planting	0.7 (1)
Seed dressing chemical	0.7 (1)
Total	5.6 (8)

Protein 3" and "High Protein 8" were preferred by farmers in the northern part of the State.¹⁶ Using scientific names such as the ones just mentioned in a social environment that is largely illiterate in Roman script can impede the communication of innovations. Communicability enhances the rate of diffusion of innovations.

Problems inhibiting the adoption of improved seed. It would appear from Table 28 that supply problems are the major constraints limiting the adoption of improved varieties.

¹⁶ National Accelerated Food Production Project (NAFPP) 1976-77, Annual Report, Pilot Phase, Kano State, page 46. The other varieties are H.P.3, H.P.8, Bauchi Selection, R21 and Bulkline 456. "H.P." is the abbreviation for High Protein.

TABLE 28

REASONS GIVEN BY FARMERS FOR NOT PLANTING IMPROVED
VARIETIES, 1976-77 SEASON

Reason	Percent farmers giving reason (number in brackets)
Not available (don't know where to obtain seed)	73.0 (65)
Not convinced it's superior to local varieties	6.7 (6)
Never heard of improved varieties	2.2 (2)
Yield not dependable	2.2 (2)
Not the tradition	2.2 (2)
Not sure of marketability	1.1 (1)
Too expensive	1.1 (1)
Other	11.2 (10)
Total	99.7 (n=89)

Approximately seven out of ten farmers who did not plant improved seed explained that they did not do so because improved seed was not available. It is interesting to note that 7 percent did not adopt because they were not convinced of the superiority of improved seed over local varieties. These two reasons also underlie the behavior of the respondents that planted both local and improved varieties.

The respondents were further asked if they would be willing to adopt improved varieties the following season, if

the problems they had mentioned could be resolved in the current season. The rationale for this approach is that the underlying reason for not using improved seed could be different from that verbalized, or the reason verbalized might encompass several other motives. It was hoped that by a process of excuse elimination, the underlying motive could be revealed. Although it appears psychologically easier to answer the question in the affirmative, three percent of the respondents said categorically they would not adopt improved varieties, even if the problem were resolved; four percent were not sure of that they would do in such a situation. One respondent explained that although he had not planted improved varieties, his friends who had done so had told him that the varieties did not perform well. Another explained that he had observed from other farmers' fields that the varieties were not improvements over the local.

To assess farmer's perception of the yield characteristics of improved varieties, respondents were asked to compare the yields of the improved varieties with the local variety. Six percent respondents (5) rated the yields less than average, 15 percent (13) rated them average and 79 percent (69) rated it above average. The data imply that 21 percent of the farmers did not consider improved varieties superior in yield to local varieties.

Yield Levels of Improved Varieties Under Farmer's Conditions

The potential yields of the improved varieties under farmers' conditions can be assessed from the production kit data. According to the 1976-77 Annual Report of the Kano State NAFPP, H.P. 8 had an average yield of 4142 kg/ha from the production kit plots established in the northern zone of the State, compared to Yar Gunki (Y.G. 5760) with a yield of 2929 kg/ha from similar plots in the southern zone. Local varieties do not enter the production kit program. The potential yields of local varieties can be assessed from the mini-kit plots where they are planted along with improved varieties, using the same management practices. The local varieties in the mini-kit had an average yield of 2314 kg/ha compared to H.P. 8 with a yield of 3175 kg/ha. The local variety in the mini-kit plots established in the southern zone yielded 4103 kg/ha compared to Yar Gunki (Y.G. 5760) with a yield of 4940 kg/ha.¹⁷ Actual farm yields using traditional practices are generally much lower. Mijindadi (1974) cites farmer's sorghum yields of 785 kg/ha in the three villages studied by Norman in Zaria.¹⁸

Complementary Practices

The performance of improved varieties depends to a

¹⁷Ibid., page 13.

¹⁸Mijindadi, N.B. Costs and Returns of Major Crops in Some Parts of Northern Nigeria; ERLS Farm Management Bulletin, Agric. Statistics Series No. 1 (1974), page 10.

TABLE 29

RELATIONSHIP BETWEEN THE ADOPTION OF IMPROVED VARIETIES OF GUINEA CORN AND OTHER MAJOR RECOMMENDED PRACTICES AMONG A SAMPLE OF FARMERS IN KANO STATE, NIGERIA, 1976-77 CROP SEASON

(a) The adoption of improved variety and seed dressing

Variety planted	Percent farmers adopting seed dressing (number in brackets)		Base N
	Not adopted	Adopted	
Local varieties	41.3 (33)	58.8 (47)	100.0 (n=80)
Local and improved varieties	10.0 (2)	90.0 (18)	100.0 (n=20)
Improved variety	8.6 (3)	91.4 (32)	100.0 (n=35)

$x^2 = 16.679$, significant at .01 level.

(b) The adoption of improved variety and close spacing

Variety planted	Percent farmers adopting close spacing (number in brackets)		Total
	Not adopted	Adopted	
Local	64.6 (51)	35.4 (28)	100.0 (n=79)
Local and improved	15.0 (3)	85.0 (17)	100.0 (n=20)
Improved	11.1 (4)	88.9 (32)	100.0 (n=36)

$x^2 = 36.319$, significant at .01 level.

TABLE 29 (continued)

(c) The adoption of improved variety and fertilizer

Variety planted	Percent farmers adopting fertilizer (number in brackets)		Total
	Not adopted	Adopted	
Local	13.0 (10)	87.6 (67)	100.0 (n=77)
Local and improved	0.0 (0)	100.0 (20)	100.0 (n=20)
Improved	0.0 (0)	100.0 (32)	100.0 (n=32)

(d) The adoption of improved variety and storage insecticide

Variety planted	Percent farmers adopting storage insecticide (number in brackets)		Total
	Not adopted	Adopted	
Local variety	52.5 (42)	47.5 (38)	100.0 (n=80)
Local and improved	30.0 (6)	70.0 (14)	100.0 (n=20)
Improved	27.8 (10)	72.2 (26)	100.0 (n=36)

$\chi^2 = 7.737$, significant at .05 level.

large extent on fertilizer use, assuming edaphic, weather, cultural and other factors are not limiting. Table 29 suggests that the farmers who used improved seed during the 1976-77 season also used fertilizer and other recommended practices. The relationship is significant at the .01 probability level for seed dressing and close spacing and at the .05 level for storage insecticide. Statistical conclusions could not be made for fertilizer, since the contingency table contained a low expected cell value. As mentioned earlier, the dosage of fertilizer used by the farmers could not be determined.

Fertilizer use. The high level of fertilizer use observed in this study is due, at least in part, to the dramatic increase in fertilizer distribution achieved in Nigeria in 1976-77 as a result of a government food production campaign known as "Operation Feed the Nation". In 1975-76, 15,000 tons of fertilizer were sold to farmers in Kano State. The 1976-77 plan envisaged a distribution of 50,000 tons.¹⁹

The diffusion of recommended fertilizer materials can be enhanced if farmers have knowledge of them. Respondents were asked to name the type of fertilizer they applied to guinea corn in 1976-77. The farmers that had used fertilizer generally knew the name of the fertilizer. The communicability of fertilizer recommendations is no doubt

¹⁹Kano State Ministry of Agriculture and Natural Resources, Progress Report, April 1975 - June 1977 (mimeo), pages 3-4. At the time the report was released 40,000 tons had been received from the Federal Government, half of which was already sold to farmers.

aided by the use of easily pronouncable names such as "Kampa" for compound fertilizer, "Salfa" for sulfate of ammonia. It appears that farmers use the recommended fertilizer combination. It would be observed that sulphate of ammonia and single superphosphate were mentioned in approximately the same frequency (Table 30). The recommendation calls for the use of single superphosphate and ammonium sulphate or calcium ammonium nitrate. The alternative recommendation of compound fertilizer was used by approximately 4 out of 10 farmers interviewed. Calcium ammonium nitrate, which has been recommended to replace sulphate of ammonia because of acidity problems, was not mentioned by any respondent. It is not clear whether the failure to mention this material reflects a communication problem or non-adoption.

Ninety-nine percent of the 127 farmers who rated the yield-increasing quality of fertilizer said that it increased the yield of sorghum. One respondent said that it depressed the yield.

The primary reasons why some respondents did not apply fertilizer to guinea corn in 1976-77 are listed in Table 31. One respondent said that even if the problem he had mentioned were resolved, he would not adopt fertilizer.

Adoption of close spacing. Fifty-seven percent of the farmers interviewed said they planted the 1976-77 crop using the close spacing suggested by the extension agent. Fifty-five percent of the farmers who did not use the practice attributed the reason to lack of knowledge (Table 32). Sixteen percent

TABLE 30

TYPES OF FERTILIZER APPLIED TO SORGHUM BY A SAMPLE OF FARMERS
IN KANO STATE, NIGERIA, 1976-77

Fertilizer (type)	Percent of total sample using fertilizer (number in brackets)*
Compound (Kampa)	37.7 (52)
Sulphate of ammonia (Salfa)	47.8 (66)
Single (20% superphos- phate)	43.5 (60)
Urea	2.2 (3)
Manure (Taki)	11.6 (16)

*Many respondents said they used more than one type of fertilizer during the season.

TABLE 31

PRIMARY REASONS GIVEN BY A SAMPLE OF FARMERS IN KANO STATE,
NIGERIA, FOR NOT USING FERTILIZER, 1976-77 SEASON

Reason	Farmers giving reasons as percentage of total sample (number in brackets)
Fertilizer too expensive	2.9 (4)
Not sure fertilizer can increase yields	2.1 (3)
Fertilizer not available	2.1 (3)
Don't know how to use fertilizer	0.7 (1)
Total	7.8 (11)

TABLE 32

PRIMARY REASONS GIVEN BY A SAMPLE OF FARMERS IN
KANO STATE, NIGERIA, FOR NOT ADOPTING RECOMMENDED SPACING

Reason	Percent farmers giving reason (number in brackets)
Have not heard	20.7 (12)
Have not been taught	34.5 (20)
Takes too much time to measure	15.5 (9)
Not the traditional way of planting guinea corn	15.5 (9)
Not appropriate for guinea corn interplanted with other crops	6.9 (4)
Don't believe it can improve yield	6.9 (4)
Total	100.0 (n=58)

felt the spacing was difficult or cumbersome to measure. The "complexity" of an innovation impedes its diffusion.

Eighty-two percent (45) of the farmers who did not adopt indicated the willingness to do so, if the specific problems identified could be resolved. Fourteen percent (8) were not sure what their adoption behavior would be; four percent (2) were certain they would not adopt. A respondent who initially said he had not used the spacing because he hadn't been taught, replied when asked further: "No, I will not use the spacing, even if I am taught; it is a lot of hard work." Another respondent who had said it was not the traditional way of

planting sorghum replied: "even if you can demonstrate that close spacing is more beneficial, I will not use it, because it wastes land", implying he would not be able to interplant other crops with guinea corn in the same field if he used the recommended spacing.

Intercropping. In an earlier section it was emphasized that monocropping is the least adopted of the improved practices being extended to farmers. This phenomenon could not justifiably be blamed on lack of promotional activities since field demonstrations have been based on sole planted sorghum. In this section, an effort is made to determine the prevalence of the practice of intercropping in the study area and to seek the reasons for the practice.

Respondents were asked if they planted guinea corn in sole or mixed stands in the preceeding year. Approximately four out of ten farmers interviewed planted all the 1976-77 sorghum crop in mixed stands, compared to one out of ten who planted in sole stands. These data imply a prevalence of intercropping over monocropping, a fact reported by earlier workers.²⁰ The intriguing aspect of the data is the use of both monocropping and intercropping practices by the same farmers. Approximately five out of ten farmers practiced both intercropping and sole cropping in 1976-77 (Table 33). The practices were carried out either on separate fields or on

²⁰ Norman, D.W. (1972). Ibid.

TABLE 33

PERCENTAGE OF RESPONDENTS GROWING SORGHUM IN MIXED STANDS,
KANO STATE, NIGERIA, 1976-77

Cropping system	Percent farmers using system (number in brackets)
All fields with guinea corn in mixed stands	36.2 (50)
All fields with guinea corn in sole stands	13.0 (18)
Some fields with guinea corn in mixed, others in sole stands	50.7 (70)
Total	99.9 (n=138)

TABLE 34

PRIMARY REASONS GIVEN BY THE FARMERS FOR PRACTICING
MIXED CROPPING

Reason	Farmers giving reasons as percentage of total sample (number in brackets)
It gives higher output	62.6 (77)
It is the tradition	16.3 (20)
I didn't have enough land	7.3 (9)
It is the best way to grow guinea corn	7.3 (9)
Other	6.5 (8)
Total	100.0 (n=123)

different portions of the same field which made it difficult to obtain a reliable estimate of the number of fields in which each practice was used. As a result, the relative prevalence of each practice among this category of respondents was not determined. Another aspect of the data which is not adequately addressed is whether the phenomenon represents a trend towards sole cropping. Several respondents said that they planted guinea corn in sole stands because the extension agent had advised it. It could well be that some farmers plant in sole stands according to advice and plant other fields in mixed stands to satisfy a more conscious inner motive (Table 34).

Reasons for Intercropping. The highest proportion of respondents (63 percent) attributed the reason for intercropping to "higher output", which is consistent with the findings of Norman (1972) from a sample of three Zaria villages.²²

Norman (1972) rightly points out the difficulty of quantifying the security motive. In the present data, it was difficult to discern the security (safety) goal from the profit motive, and vice versa. In reality, it is very difficult, sometimes impossible, to isolate or categorize human motives.²³ The safety motive is implied in the profit motive. Higher

²² Ibid., page 89.

²³ The nature of human motives is adequately treated in Maslow's hierarchy of needs, which is discussed in Chapter 2: Review of the Literature.

production (output) satisfies the safety need (security from food wants) as well as the profit motive.

The other reasons given for the practice of intercropping are probably related to the safety and profit motives, too. The "best way to grow" a crop might be that which meets safety and profit goals. The "traditional" method might be the one which has evolved over the years to satisfy felt needs for profit and safety. Food safety can be real [(e.g., when the family suffers food shortage or psychological (e.g. the threat of hunger and the insecure feeling associated with it))].

The use of intercropping as a strategy against risks and uncertainties was vividly illustrated by the respondent who had planted one field of guinea corn in sole stands and another in mixed stands. The field planted in sole stands was liable to occasional flooding; the field planted in mixed stands was not likely to be flooded. Planting the field liable to flooding mixed stands increases the chances of his losing several crops, the respondent explained.

The practice of intercropping is particularly relevant in Kano State which is "land-short."

The need to direct research emphasis to intercropping cannot be over-emphasized. In spite of the long tradition of agronomic research in northern Nigeria extendable technology for intercropped guinea corn is still lacking.

Motivating the Adoption of Recommended Practices: Farmers' Suggestions

The degree to which a person perceives a problem

determines his attitude and responsiveness to ways of solving the problem. The danger in the social environments where farmers are largely illiterate, poorly organized and not vocal enough to make their felt needs known is for extension program planners to assume the paternalistic attitude that persons without functional literacy are not capable of meaningful participation in need identification. As a result, planners would design problem-solving programs without involving the people for whom the programs are intended. The result could be lack of response from the clientele if they do not perceive it as relevant to their situation.

In an effort to seek information from farmers on the problems hindering the diffusion of improved farming practices, they were asked to make suggestions on what ought to be done to get new farming practices adopted. To emphasize the importance of the information, respondents were told that they were going to be asked "the last and most important question".

Table 35 summarizes the responses in detail. No order of priority or importance is implied in the presentation.

The responses suggest a pre-eminence of labor-related problems, a trend revealed in earlier sections. Suggestions intended to minimize labor problems account for 34 percent of the proposed solutions. The introduction or strengthening of tractor hire was implied in 20 percent of the suggestions. It is sometimes argued that labor-saving devices such as farm machinery are not appropriate technologies for low income countries with abundant labor, such as Nigeria. The paradox of

TABLE 35

SUGGESTIONS BY A SAMPLE OF FARMERS IN KANO STATE, NIGERIA,
ON HOW TO ENCOURAGE ADOPTION OF RECOMMENDED PRACTICES

Opinion	Number of times expressed
Make tractor hire service available to reduce labor shortage	86
Provide oxen and plows	46
Provide farm tools	9
Subtotal	<u>141</u>
Make fertilizer readily available	67
Increase fertilizer supply	16
Build stores where farmers can buy fertilizer and/or other inputs, obtain information, hire tractor	6
Make improved seed available	47
Provide seed dressing chemicals	24
Make storage insecticide more readily available	7
Increase supply of seeds of other crops (ground nut, maize, millet)	8
Make all necessary inputs available	6
Other	2
Subtotal	<u>183</u>
Government should provide farmers with credit	22
Provide credit to farmers	17
Give farmers loans	17
Provide loans for work bulls	6
Other	1
Subtotal	<u>63</u>

TABLE 35 (continued)

Opinion	Number of times expressed
Reduce the price of fertilizer and seed dressing chemicals	1
Increase subsidy on agricultural inputs	1
Subtotal	2
Provide more extension agents	11
Assign well-qualified extension agents to advise farmers frequently	5
Assign extension agents to rural areas and/or to own village to teach new farming ideas	6
Establish farmers' committees to ensure cooperation among farmers, and to seek cooperation of Ministry of Agriculture; teach farming practices through the committees	3
Others	6
Subtotal	31
Grand total	420*

* Each respondent made several suggestions.

the labor situation in Nigeria is that although labor appears abundant, farm families suffer labor shortages at peak periods of farm operations. A program of selective mechanism which is complementary to human labor might be an appropriate strategy for addressing the problem.

A non-economic but, nevertheless, very important argument for tractor use in traditional agricultural systems is made by Millikan and Hapgood (1967):

Prestige is an important intangible . . . one of the most subtle barriers to progress is the low status of agriculture. Farming is drudgery and it is 'primitive'; the innovative people needed for progress flee instead to the modern world of the city. Machines are a symbol of that modern world. The presence of tractors and other machines in rural areas may serve to demonstrate that being a farmer and being 'modern' are not mutually exclusive, and thus the status of the farmer may be raised. Even if he does not have a tractor himself he may stay and work for a tractor instead of migrating to the city, and to get that tractor, with the status it symbolizes he may be willing to innovate.²⁴

Farm supplies, particularly fertilizer, improved seed and seed dressing chemicals feature prominently in the proposed solutions. They account for approximately 44 percent of the suggestions. The message appears to suggest that farmers will adopt recommended practices if the supply situation is improved.

Respondents recognized the need for effective extension input. Although extension related suggestions accounted for only 7 percent of the proposed solutions, the message was clear and urgent. Some respondents felt a need for "a good and well

²⁴Ibid., page 47.

qualified extension worker", others wanted demonstrations sited on their farms to help them to "understand the improved practices". A respondent suggested that the agricultural officer visit them to see how they are "following the recommended practices". The suggestions for the establishment of farmers' committees, increasing the number of field demonstrations, and offering greater learning experiences for farmers are very sound. A farmer suggested that "production kits should be located in more people's fields", while another was of the view that showing films on new practices before the planting season would help older farmers learn improved practices. Extension teaching through farmers' committees was also mentioned.

The price of inputs did not appear to be a problem perceived by farmers. The few suggestions made in this regard may reflect the effectiveness of government subsidies in bringing the price of inputs within farmers' reach. Price subsidy and price reduction were mentioned only 2 times out of 420 suggestions. In Kano State a 50 kilogram bag of urea, sulphate of ammonia and compound fertilizer cost only ₦ 2.00, ₦ 1.00 and ₦ 2.00, respectively.²⁵ Land preparation using the government tractor hire service costs only ₦ 2.00 per acre of upland (dry land) field. Credit and loans account for 15 percent of the solutions, but they were not mentioned in connection with purchased inputs.

²⁵ For the dollar equivalent of the naira (₦), see section on definitions, page 25.

Some of the suggestions are thought provoking even if they are minority opinions. Some farmers suggested that stores should be built where inputs could be readily purchased and technical information obtained. The suggestions are quite similar to the concept of "one-stop shop", now accepted in Nigeria as part of the strategy for a dependable input distribution.

In retrospect, the order of asking "a most important question last" should have been altered half-way through the survey, to see if asking the question "first", will produce similar responses. Since this procedure was not used, possible sensitization can only be a matter for speculation.

Conclusion

The preceeding section adds to the emerging empirical data against the typology of the small scale farmer as tradition-bound and innovation resistant. It lends support, if only intuitively, to the positive concept of the small scale farmer as a good manager of "indigenous technology" who is profit seeking and risk averting. The small scale farmer is innovative, given the programs and facilities that are appropriate to his situation. If he appears otherwise, it is probably because of the system that stimulated the need for change, without providing the necessary resources and facilities to effect the change.

Chapter V

SUMMARY, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDY

The growth theory of motivation, postulated by Maslow (1970) and "theory Y", proposed by McGregor (1957) offer a theoretical framework for planning and conducting extension programs in traditional societies. This implies that small scale farmers have potential for growth. They are not, by nature, resistant to change per se. If they appear unresponsive to agricultural programs, innovations, and technologies designed to improve productivity and raise levels of living, it is because of the social, economic and physical environment in which they operate. The role of extension is to help them improve their quality of life. To be effective, extension must also address the situational factors that enhance or inhibit clientele motivation. This conceptual framework formed the basis for the present study in Kano state of Nigeria. The study was designed to determine those factors that might enhance the motivation of small scale farmers to adopt improved agricultural practices.

Restatement of Research Objectives

The specific objectives of the study were: (1) to determine the personal characteristics of guinea corn (sorghum) producing farmers; (2) to determine the effect which

characteristics such as age, farming experience, literacy, size of family, size of farm, family/work organization, off-farm occupation, and leadership positions might have on the adoption of agricultural innovations; (3) to measure the effects of extension inputs, production inputs, and farm mechanization on the adoption of agricultural innovations; (4) to identify those factors presumed to affect farmer motivation; (5) to seek an understanding of farmers' perceptions of improved guinea corn production practices; and (6) to make recommendations on how to improve the relevance of improved technologies and to heighten farmers' motivation to adopt improved practices. Three null hypotheses were developed: (1) there is no relationship between the personal characteristics of Kano farmers and the adoption of improved guinea corn production practices; (2) there is no relationship between extension agent/farmer contact and the adoption by farmers of recommended practices for guinea corn production; and (3) NAFPP field programs for guinea corn production have not enhanced farmers' motivation to adopt guinea corn production practices.

Abstract of Research Method

A review of the pertinent literature revealed a dearth of empirical information on the application of motivation theory to the adoption of agricultural innovations in traditional societies. In order to predict human behavior, Teevan and Smith (1967) suggest that it is necessary to know, among other things, why a certain behavior occurs when it does. A

questionnaire was designed primarily to determine "why" subjects did or did not use improved practices in their farming enterprises at a particular point in time. After two levels of pre-testing, the questionnaire was administered to 138 farmers randomly selected from 16 villages in 6 districts where NAFPP mini-kits and production kits had been used. Twenty-eight farmers that had taken part in the NAFPP in the villages were interviewed in the sample.

Summary of Research Findings

A fuller presentation of the findings of this study can be found in Chapter IV. In this section the major findings are high-lighted in relation to the objectives.

Approximately three-fourths of farmers growing guinea corn in Kano are below 50 years of age. Most of the farmers (62 percent) are literate in Arabic script. Fewer farmers (24 percent) are literate in both Roman and Arabic scripts. Only 2 percent of the farmers completed their elementary education.

Iyali, the simple family unit consisting of a married man and his dependents accounted for 67 percent of all family units while gandu, the composite unit consisting of two or more adult males, their wives and children, made up the remaining 33 percent. About three-fourths of all the gandu units were paternal. The size of households varied from 2 to 39 with a mean of 10.6 and median of 8.2. The median size of the family labor force was 2.5 persons. The median size of guinea corn fields estimated from labor input, was 6.6 acres. There was

considerable variability in the size of guinea corn fields. The maximum size of guinea corn fields owned by an individual was 29 acres; the minimum was 1 acre. Most of the farmers had off-farm occupations.

Several variables thought to be associated with the adoption of recommended practices were assessed with the view to testing the hypothesis of independence of personal characteristics and the adoption behavior of respondents. Labor force, family size, farm size and seasonality of off-farm occupation were found to be significantly related to the organization of family farming units. The farmers who were associated in composite (gandu) farming units had significantly larger farms, bigger families and numerically stronger labor forces than the smaller (ivali) units. The differences observed in the adoption of fertilizer, seed dressing, storage insecticide and close spacing by respondents classified according to farming units and pooled on the basis of family size were highly significant. There appears, therefore to be sufficient evidence to reject the null hypothesis of independence of family size, as a personal variable, and the adoption of recommended practices. The relationship between family labor force and the adoption of recommended practices was not statistically significant. The null hypothesis of independence of labor force, as a characteristic of subjects, and the adoption of recommended practices is accepted.

Although, in percentage terms, the bigger farmers adopted recommended practices more than the smaller ones, the incidence of low expected cell counts in the contingency tables

precluded the statistical conclusions that could have been made of the relationship between farm size and the adoption of recommended practices. Whereas, no significant differences in occupation affiliation were observed between the ivali and gandu respondents, the differences between the two categories of respondents in the seasonality of off-farm occupations was found to be statistically significant, as a preponderance of gandu respondents undertook off-farm occupations all year round.

Seasonality in off-farm occupation was found to be significantly related to the use of fertilizer, improved seed, seed dressing and storage insecticide. The relationships between literacy and the adoption of seed dressing chemicals and close spacing were found to be statistically significant. The relationship between literacy and the adoption of storage insecticide was, however, not statistically significant. No statistical conclusions could be made about the relationships between literacy and fertilizer and improved seed, because of the incidence of low expected cell counts. The use of production credit showed significant relationship to practice adoption.

It is interesting to note, that in percentage terms, the farmers that were literate in both Roman and Arabic scripts adopted innovations more than those literate only in Arabic script. The farmers that were literate only in Arabic script in turn adopted improved practices more than those who had no literacy of any type. The data appears to suggest the relative advantage which the more literate farmers have over the less literate in assimilating agricultural information.

Although the younger farmers were expected to be more

innovative than the older farmers, the data showed no significant relationship between age and the adoption of recommended practices. Similarly, no significant relationship was observed between farming experience and the adoption of recommended practices. There is therefore evidence to accept the null hypotheses of independence of age, farming experience, and the adoption of recommended practices.

Head of household and official position as indices of social status showed significant relationship to the adoption of improved varieties of guinea corn but not to other recommended practices.

Several measures were used as independent variables to test the relationship between extension agent/farmer contact and the adoption of recommended practices. A highly significant relationship was observed between the frequency of extension agent farm visits and the adoption of recommended practices by farmers. This provides support for the continuation of the present policy of "intensive contact" as a strategy for inducing change. The data suggests that farmers who enjoy more visits from the extension agent adopt recommended practices more often than those having fewer visits. Significant differences were observed in the adoption behavior of the farmers that seek extension agents' advice compared with those who do not. This suggests the importance of the personality orientation of a farmer.

A primary objective of the study was to ascertain if the NAFPP field programs were inducing farmers to adopt improved

practices. The data supports the view that farmers who have been exposed to the mini-kit or production kit plot adopt improved practices more than those without similar exposure. The data supports the view that the extension guinea corn result demonstration is also effective in inducing change.

There were considerable differences in the level of adoption of the improved practices suggested for guinea corn production. Fertilizer was the most widely adopted of the improved practices. Monocropping was the least acceptable. Most farmers in Kano State practise intercropping because it gives "higher output". The practice of intercropping is a strategy against risks and uncertainties. The higher output obtainable from intercropping has economic advantages. Socially it meets the esteem need of the farmer as well. A good farmer enjoys respect of other farmers. The title sarkin noma is often bestowed on the most outstanding farmer.

Farmer Perception of Improved Practices

Most farmers perceive the recommended practices as superior to traditional practices. An overwhelming number rated the yield of fertilized guinea corn as "more than average". In contrast, approximately 21 percent did not consider the yields of improved varieties of guinea corn superior to local varieties. The relationship between the adoption of improved varieties and the use of complementary practices such as fertilizer, seed dressing chemical, and close spacing was found to be statistically significant. This implies that the

farmers that adopted improved seed also used fertilizer and the other practices. It is not certain whether the relatively low rating of improved varieties reflects low yield response to possible sub-optimal fertilizer dosages, or some inherent quality of the planting materials.

Enhancing the Adoption of Recommended Practices: Farmer's Suggestions

The reasons most frequently mentioned by farmers for not using recommended practices is a lack of supplies of purchased inputs. Most of the farmers who did not adopt recommended practices in 1976-77 indicated a willingness to do so in the future if the specific problems they had identified with the practices could be resolved. Contrary to a belief held by some, small scale farmers are willing to adopt those innovations they perceive as advantageous and are relevant to their situation. To enhance the adoption of recommended practices the farmers suggested: (1) that fertilizer, improved seed, seed dressing chemicals, and storage insecticides be made readily available; (2) that tractor hire services be expanded to ease labor problems; (3) that more extension agents be assigned to villages and existing extension services strengthened to provide more effective advice on new farming practices; and (4) that credit or loans be provided. The price of purchased inputs did not appear to be a problem perceived by farmers.

Conclusions

The survey instrument accomplished the primary

objectives of the study. In some instances the incidence of low expected cell frequencies restricted the statistical conclusions that could have otherwise been reliably made. The problem would probably have been minimized had a larger sample size been used. This was not possible because of the time and resource constraint.

A number of conclusions can be made from the study:

1. Small scale farmers in Kano State are responsive to improved technologies.
2. Many farmers fail to adopt the recommended practices because of certain constraints, notably lack of inputs and inadequate extension contact.
3. Farmers in Kano State generally perceive the improved practices as yield increasing innovations. The effect of fertilizer on the yield of guinea corn was overwhelmingly endorsed by the farmers. In contrast about one-fifth of the farmers did not consider the improved varieties of guinea corn as superior in yield to local varieties. Acceptance of the spacing recommendation is constrained by several factors among which are lack of information or knowledge of the practice, the difficulty of measuring the spacing, and the problems associated with practicing intercropping in fields planted at close spacing.
4. Intercropping is generally preferred by Kano farmers to monocropping, mainly because of the "higher output" obtainable from the practice.
5. Extension contact is an important variable in the

adoption of recommended practices. Intensive contact is more effective in changing farming practices.

6. NAFPP field programs, the mini-kit and the production kit, are effective in inducing change as is the extension guinea corn result demonstration.

7. The personality orientation of a farmer is an important factor in his adoption behavior. The farmers that seek extension agent advice tend to adopt improved practices more than those who do not.

8. The personal characteristics of literacy in Roman and/or Arabic script, size of household and social status, influence adoption behavior; characteristics of age and farming experience do not.

9. The farmers who operate larger size farms tend to adopt improved practices more than those operating smaller farms. Some differences exist between the farmers working in simple family units (iyali) and those working on composite (gandu) units. The gandu respondents tend to operate larger farms, have larger households, a stronger labor force and tend to pursue off-farm occupations year-round.

✓10. Many farmers in Kano State are facing labor problems.

11. The incidence of discontinuance of innovations in Kano State is not common.

12. Production credit appears to enhance the adoption behavior of farmers.

13. The findings in this study have practical application to the modernization of Nigerian agriculture.

Preliminary analysis of the second measurement

instrument designed to assess the influence of village socio-economic variables, particularly change agent residency showed that the villages without extension agents were too few for meaningful conclusions to be drawn from the data. The assessment of village socio-economic variables was not a primary objective of the study.

Recommendations

These recommendations are based on the findings of this study, the author's personal knowledge of the situation and observations made while gathering data in the field.

1. Priority consideration should be given to reducing the ratio of extension agents to farmers by employing and training more persons for agricultural extension work. Many farmers are not being reached by extension agents.

2. Through field days, farm walks, and other methods, extension agents should ensure that as many farmers as possible are exposed to critical operations of quality field demonstrations. Exposure of farmers to field demonstrations influences the adoption of recommended practices.

3. Twice-a-month, or certainly once-a-month visits, should be made by agents to farmers' fields. Frequency of extension agent's visit to farms influences the adoption of recommended practices by farmers. Extension agents should make more contacts with farmers.

4. In selecting farmers for NAFPP programs, take into account those personal characteristics related to the adoption

of recommended practices. Identify farmers literate in Roman or Arabic scripts and with larger farms and households, and in leadership positions, then concentrate on them initially.

✓ 5. Establish more extension committees in villages. Only a few villages have extension committees at present. Involve the committees in setting target and in planning and implementing village extension programs. People support what they help create. Each hamlet in the village should be represented in the committee, many hamlets are located far from the main village. To be actively involved, they ought to be represented. The village heads should be given the prerogative to nominate one or two members, in recognition of existing community power structure. The A.A. or A.I. should serve as secretary. The elected and/or selected members should elect a chairman.

6. Plan annual NAFPP programs such as mini-kit and production kit demonstrations from the "grassroots". This procedure will encourage more local involvement. ERLS specialists and State NAFPP headquarters staff should help village committees plan their programs. Village programs should be coordinated at district and divisional levels.

✓ 7. Inservice courses for A.A.'s and A.I. should focus on program development. The training should also cover pertinent aspects of the theory and practice of motivation and adoption and diffusion of innovations to make them more effective in working with farmers.

8. Recommendations for guinea corn production should be developed for guinea corn grown as a mixed crop. The

existing improved technology based on monocropping is not relevant to the farmer's traditional method of growing crops in mixed stands. Research programs need to be oriented more towards farmers' problems. Involve farmers in field trials to test new technology. The mini-kit program was designed to involve farmers in the final stages of the selection of new varieties and to serve as an extension teaching tool. The guinea corn mini-kit package needs to be reviewed in order to determine: (1) the relative advantages of different planting materials; (2) complexity of the package; and (3) the relevance of the package to the cropping system.

9. To improve the communicability of improved technologies, it is suggested that planting materials entering farmers programs be given local names. Scientific names are difficult to pronounce and hard to remember.

10. The writing of mini-kit instructions should be reviewed so as to make them motivation-oriented. They should be written so simple that the farmer with functional literacy can follow them. More importantly, instructions for the mini-kit and production kit should be provided in English for extension workers, and in Hausa, using the Arabic script (Ajami) for farmers. Most of the farmers in Kano State are literate in Arabic script. Many of the States in northern Nigeria have high populations that are literate in Arabic script. Because of its religious flavor, messages coded in Arabic script are said to enjoy high credibility. Where appropriate, extension recommendations should be made in Hausa using Arabic script

(Ajami) to the northern states having high literacy in Arabic script. Mini-kit, production kit and result demonstration sign boards should be prepared in Arabic script.

11. The communication of recommended practices needs to be reviewed. Titles such as "recommended practices for guinea corn production" may be excellent for academic audiences but not for the farmer or the village level extension worker. Recommendations should be written in such simple terms that a person with functional literacy can follow them. As far as possible, extension recommendations should be written from the point of view of the potential users of the recommendations. Concepts such as weights and area measurements are not in the farmers' frame of reference. Extension recommendations directed at farmers should be motivation-oriented.

12. The motivation of farmers to adopt improved practices can be enhanced by giving recognition and honor to outstanding adoptors. A "best farmer of the year" contest should be organized with the view to selecting innovation adopting farmers, first at the village level and then at the district level. They should be honored at public ceremonies to be organized jointly by divisional agricultural offices and local government departments of agriculture. The purpose is to appeal to the egoistic needs of farmers. Traditionally the best farmers in Hausa communities are honored, and sometimes turbanned by district heads.

13. The allocation of production kits to villages

should be considerably increased over the existing level. The NAFPP in Kano State is now in the mass production phase. The number of production kits in the villages studied were so few, it is doubtful if the impact had really been felt in 1976-77. Each hamlet of the village should be allocated at least one production kit. If, due to staffing, budget or other constraints, the program cannot be expanded beyond the present level, the geographical coverage should be reduced so that attention could be focused on a few districts.

14. If the problem of input distribution is not resolved, the "snowball effect" of the NAFPP may not be felt for a long time. Input distribution is still a serious problem as perceived by farmers inspite of the tremendous improvement in fertilizer supply in the last five years.

15. There is need to strengthen the tractor-hire service which appears to be popular with farmers. Tractor use can enhance the adoption of modern farming practices. As a long term measure, research should be undertaken to determine an appropriate mechanization strategy. More efficient but simple hand tools and ox-drawn equipment would be appropriate. A simple manual or ox-drawn planter with adjustable planting distances could greatly enhance the adoption of recommended planting distances and the establishment of optimum plant population.

16. Urgent thought should be given to a farmers' loan or credit program. Part of the loan should be in the form of fertilizer and improved seed and part in cash. At present there

are no credit facilities to support the NAFPP program in Kano State. Most of the farmers using credit obtained it from non-institutional sources, which are not only scarce but sometimes not socially well perceived. Most of the credit received by farmers was used for hiring labor, with smaller amounts expended on purchased inputs and non-farm items.

Suggestions for Further Study

1. Regular appraisal of the mini-kit and production kit programs should be made at the village level to determine their weaknesses and strengths.

2. Diffusion of innovation studies should be undertaken in the NAFPP program to determine the rate of adoption of innovations and predict program impact.

3. Studies should be conducted to determine more precisely the level of adoption of inputs. The present study did not address the level of use of recommended inputs. It is likely that many farmers are using sub-optimal dosages of production inputs.

4. Studies need to be conducted to determine the characteristics of extension agents which enhance their effectiveness as change agents. Such information could then be used in staff development programs. Some farmers perceive the need for "good and well-qualified extension agents". The personal characteristics of extension agents affect their credibility with farmers.

5. Further studies need to be conducted to provide

empirical data on the role of village socio-economic variables. The present study did not address the relevance of village socio-economic variables to agricultural development adequately.

6. More emphasis needs to be directed at the socio-economic aspects of agricultural development in planning research programs. Some of the available improved technologies are not relevant to the situational needs of farmers.

7. Further research is needed to determine the optimum level of field contact that is effective in inducing change and that will allow the agent time to visit more farms. The information could be obtained through field experimentation.

8. Further studies are needed to determine the grain marketing system and accompanying problems to provide a basis for an educational strategy. Many of the farmers interviewed sold their grains cheaply soon after harvest, only to buy more dearly later on in the season.

9. The communication of recommended practices needs to be more thoroughly researched. Present recommendations are difficult to follow by farmers and village level extension agents. They also lack motivation appeal.

10. Applied research should be conducted into farm labor utilization to evolve location-specific recommendations for estimating acreages from labor input. Weights and area measurements on which many recommendations are now based are not in the farmers' frame of reference. Labor input can be used to prepare acreage estimates for the guidance of farmers and village level extension staff.

✓ 11. Agronomic research should be intensified to develop sorghum varieties with desirable and more outstanding qualities. Approximately one-fifth of the farmers interviewed did not consider the yield of the available improved varieties superior to local varieties.

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APPENDIX

APPENDIX I

Respondent No. _____

NATIONAL ACCELERATED FOOD PRODUCTION
PROJECT (NAFPP)Questionnaire for the Study of
MOTIVATIONAL FACTORS RELATED TO THE ADOPTION OF
IMPROVED FARM PRACTICES
1976/77 Crop Year

Name of farmer _____

Village _____

District _____

Local Govt. area _____

1. What is your age?

- _____ below 20 years
- _____ 20 to 29 years
- _____ 30 to 39 years
- _____ 40 to 49 years
- _____ 50 to 59 years
- _____ over 60 years

2. Are you married?

- _____ No
- _____ Yes

3. How many persons eat from the same pot with you?

- _____ Head of pot (number)
- _____ Wives of head of pot (number)
- _____ Children of wives of head of pot (number)
- _____ Other married males (number)
- _____ Wives of other males (number)
- _____ Children of wives of other males (number)
- _____ Unmarried adult males (number)
- _____ Unmarried adult females (number)
- _____ Other children (number)
- _____ Total number of persons in pot

*Pot is used throughout this questionnaire to denote a family unit. It is a direct translation from the Hausa: Suna ci daga tukunya daya -- "those people eating from one pot."

4. Is your pot organized as iyali or gandu?
 _____ Iyali, i.e. family unit consisting of male head his wife or wives and dependent children.
 _____ Gandu, i.e. family unit consisting of two or more adult males, their wives and dependent children.
 If gandu, are you the gandhu head?
 _____ No
 _____ Yes
5. Do you farm with another adult male or males?
 _____ No. If no, skip to question 7.
 _____ Yes. If yes, what relation is he or are they?
 _____ Father-son
 _____ Brother-brother
 _____ Uncle-nephew
 _____ Other (specify) _____
6. What is the total number of adult males farming together?
 _____ number of adult males
7. How many persons including yourself, your dependents, the other person or persons, his or their dependents work on regular basis on the farm(s)?
 _____ number adult males
 _____ number adult females
 _____ number children 12 years old and over.
8. Are you a head of pot?
 _____ No. If no, skip to question 10.
 _____ Yes. If yes, proceed to question 9.
9. How many years have you been head of pot?
 _____ number years
10. Are you a head of compound?
 _____ No
 _____ Yes
11. Do you hold any official position in the village, District or Local Government Area?
 _____ No. If no, skip to question 13.
 _____ Yes

12. What are the official positions which you hold?
- ☐ village head
☐ scribe
☐ hamlet head
☐ Councillor
☐ District Head
☐ Member of Cooperative Union
☐ Member of Agricultural Extension Council or Committee
☐ Other (specify) _____
13. Can you read and write in Arabic and/or Roman script?
- ☐ Can read both Arabic and Roman Scripts
☐ Can read Arabic but not Roman Script
☐ Can read Roman but not Arabic Script
☐ Cannot write or read Roman or Arabic Script.
14. How many years have you attended Koranic School?
- ☐ Number years
15. How many years have you attended Primary School?
- ☐ Number years
16. How many years have you attended adult education class?
- ☐ Number years
17. Are you a full-time farmer?
- ☐ No
☐ Yes
18. What is your other main occupation besides farming?
- ☐ Trading
☐ Teaching (specify Koranic or Primary School teaching)

☐ Cattle herding
☐ Butchering
☐ Barbering
☐ Tailoring
☐ Labour _____ on other farms _____ non-farm
☐ Other (specify) _____
19. Do you pursue this other main non-farm occupation just mentioned throughout the year or only during the dry season?
- ☐ Throughout the year
☐ Dry season only

20. Is there any extension worker located in this village?
____ No
____ Yes. If yes, skip to question 22.
____ Don't know (not certain)
21. Does any extension worker visit this village from any other village to advise the farmers of this village on how to improve g'corn production?
____ No
____ Yes
____ Don't know (not certain)
22. Does this village have an extension council or committee?
____ No
____ Yes
____ Don't know (not certain)
23. When did an extension worker last visit a gona (field) in which you grew guinea corn?
____ This year (1977/78 crop year)
____ Last year (1976/77 crop year)
____ Two years ago (skip to question 25 if two years ago)
____ More than two years (skip to question 25 if more than two years)
____ Never visited (skip to question 25 if never visited)
24. How many times did an extension worker visit the gona (field) in which you grew guinea corn last year?
____ Number of times
25. Have you or any person eating from the same pot as yourself gone to an extension worker to seek advice on how to improve guinea corn production before?
____ No
____ Yes
26. Have you seen an extension guinea corn demonstration plot before?
____ No
____ Yes. If yes, where did you see it?
____ Roadside
____ Government farm
____ Your own farm
____ Relative/friend's farm
____ Other (specify) _____
27. Have you taken part in the extension g'corn demonstration as a cooperator?
____ No
____ Yes

28. If you have seen or taken part in the extension guinea corn demonstration plot, how effective or useful, was it in encouraging you to adopt improved guinea corn production practices?
- ☐ Haven't seen or participated
☐ Very effective (very helpful)
☐ Somewhat effective (somewhat helpful)
☐ Don't know (not certain)
29. Have you seen a guinea corn Mini-kit plot before?
- ☐ No
☐ Yes. If yes, where did you see it?
☐ Roadside
☐ Government farm
☐ Your own farm
☐ Relative/friend's farm
☐ Other (specify) _____
30. Have you taken part in the guinea corn mini-kit program as a cooperator?
- ☐ No
☐ Yes
31. If you have seen or taken part in the mini-kit program, how effective or helpful was it in encouraging you to adopt improved guinea corn production practices?
- ☐ Have not seen or participated
☐ Very effective (very helpful)
☐ Somewhat effective (somewhat helpful)
☐ Don't know (not certain)
32. Have you seen a guinea corn production kit plot before?
- ☐ No
☐ Yes. If yes, where did you see it?
☐ Roadside
☐ Government farm
☐ Your own farm
☐ Relative/friend's farm
☐ Other (specify) _____
33. Have you taken part in the guinea corn production kit plot as a cooperator?
- ☐ No
☐ Yes

34. If you have seen or taken part in the guinea corn production kit program, how effective or helpful was it in encouraging you to adopt improved guinea corn production practices?
- ☐ Very effective (very helpful)
 - ☐ Somewhat effective (somewhat helpful)
 - ☐ Ineffective (Unhelpful)
 - ☐ Don't know (not certain)
35. If you have taken part in the extension guinea corn demonstration, guinea corn mini-kit or guinea corn production kit program as a cooperator, explain how you were selected.
- ☐ Have not taken part as a cooperator
 - ☐ Selected by the village head
 - ☐ Selected by the extension council or committee
 - ☐ Selected through Young Farmer's Club
 - ☐ Other (specify) _____
 - ☐ Don't know (not certain)
36. Did the extension worker explain to you why you were selected?
- ☐ No
 - ☐ Yes. If yes, did you indicate the willingness to participate?
 - ☐ Most willing
 - ☐ Somewhat willing
 - ☐ Participated because I was told to do so
37. If you have seen or taken part in extension guinea corn demonstration, guinea corn mini-kit and/or guinea corn production kit program which one do you consider most effective or most helpful in encouraging you to adopt improved guinea corn production practices?
- ☐ Have not seen or participated in any (skip to question 40 if he has not seen or participated)
 - ☐ Extension g'corn demonstration plot
 - ☐ G'corn mini-kit plot
 - ☐ G'corn production kit plot
 - ☐ All three equally effective. (Skip to question 39 if answer is "equally effective")
 - ☐ Don't know (not certain) (Skip to question 39 if answer is "don't know" "not certain")
38. Give the main reason why you consider the program you have just chosen (in question 37) the most effective or helpful.
- ☐ Because it was located on my farm.
 - ☐ I participated fully and learnt to carry out the various practices.

- ☐ I was able to observe the advantages of the improved practices.
- ☐ I felt that the package of practices would be profitable.
- ☐ The practices were not expensive.
- ☐ I did not have to pay the costs.
- ☐ The extension worker visited the plots and discussed them with me.
- ☐ The practices were easy to follow.
- ☐ Because I was selected to participate.
- ☐ Other (specify) _____

39. What new (improved) production practices have you learnt from the field demonstration(s)?

- ☐ None
- ☐ Time of planting
- ☐ Improved seed
- ☐ Seed dressing
- ☐ Seed rate
- ☐ Spacing (2 feet apart on 3 foot ridges for tall varieties; 1 foot 6 inches or 1 foot apart on 3-foot ridges for dwarf varieties, i.e. close spacing)
- ☐ Fertilizer use
- ☐ Weed control
- ☐ Storage insecticide
- ☐ Monocropping, (growing only one crop at a time in one field)
- ☐ Thinning to 2 plants per stand
- ☐ Other (specify) _____

40. Which of the improved practices have you used to grow g'corn?

- ☐ None
- ☐ Time of planting
- ☐ Improved seed
- ☐ Seed dressing
- ☐ Seed rate
- ☐ Spacing
- ☐ Fertilizer use
- ☐ Weed control
- ☐ Storage insecticide
- ☐ Monocropping (growing only one crop at a time in one field)
- ☐ Thinning to 2 plants per stand
- ☐ Other (specify) _____

41. To which of your guinea corn farm(s) have you applied the improved practice(s) just mentioned?

(a) Time of planting

- ☐ All the fields
- ☐ Biggest field only
- ☐ Smallest field only

- ☐ Biggest and smallest fields only
☐ Some other field
☐ Number of gona (fields) planted at recommended planting time

Did you control the g'corn farm(s) planted at the recommended planting time? (Tick appropriate answer)

- ☐ Farm or all farms controlled by farmer
☐ Some but not all farms controlled by farmer

(b) Improved seed

- ☐ All fields
☐ Biggest field only
☐ Smallest field only
☐ Biggest and smallest fields only
☐ Some other field
☐ Number of gona (fields) planted with improved guinea corn seed.

Did you control the farm(s) planted with improved g'corn? (Tick appropriate answer)

- ☐ Farm or all farms controlled by farmer
☐ Some but not all farms controlled by farm

(c) Seed dressing

- ☐ All fields
☐ Biggest field only
☐ Smallest field only
☐ Biggest and smallest fields only
☐ Some other field
☐ Number of gona (field(s)) with seed dressing chemical

Did you control the farms with seed dressing chemical? (Tick appropriate answer)

- ☐ Farms or all farms controlled by farmer
☐ Some but not all farms controlled by farmer

(d) Spacing

- ☐ All fields
☐ Biggest field only
☐ Smallest field only
☐ Biggest and smallest fields only
☐ Some other field
☐ Number of fields planted at recommended spacing

Did you control the gona (field(s)) planted at recommended spacing? (Tick appropriate answer)

- ☐ Farm or all farms controlled by farmer
☐ Some but not all farms controlled by farmer

(e) Fertilizer

- ☐ All fields
- ☐ Biggest field only
- ☐ Smallest field only
- ☐ Biggest and smallest fields only
- ☐ Some other field
- ☐ Number of fields with fertilizer

Did you control the gona (field(s)) with fertilizer?
(Tick appropriate answer)

- ☐ G'corn farm or all guinea corn farms controlled by farmer
- ☐ Some but not all g'corn farms controlled by farmer

(f) Storage insecticide

- ☐ All the guinea corn harvested
- ☐ Some but not all the guinea corn harvested
- ☐ None

Did you control the guinea corn treated with storage insecticide? (Tick appropriate answer)

- ☐ All the g'corn controlled by farmer
- ☐ Some but not all the g'corn controlled by farmer

(g) Monocropping

- ☐ All fields
- ☐ Biggest field only
- ☐ Smallest field only
- ☐ Biggest and smallest fields only
- ☐ Some other field
- ☐ Number of guinea corn fields monocropped

Did you control the farm monocropped? (Tick appropriate answer)

- ☐ All fields monocropped controlled by farmer
- ☐ Some but not all fields monocropped controlled by farmer

(h) Thinning

- ☐ All fields
- ☐ Biggest field only
- ☐ Smallest field only
- ☐ Biggest and smallest fields
- ☐ Some other field
- ☐ Number of fields thinned

Did you control the thinned g'corn field(s)? (Tick appropriate answer)

- _____ All thinned g'corn field(s) controlled by farmer
 _____ Some but not all thinned g'corn field(s) controlled by farmer

(i) Other improved practice(s) used for guinea corn production (specify) _____

- _____ Biggest field only
 _____ Smallest field only
 _____ Biggest and smallest fields only
 _____ Some other fields
 _____ Number of fields with "other" improved practice(s)

42. How many gona (fields) did you control last year?

- _____ Number gandu farms controlled by farmer
 _____ Number gayauna farms controlled by farmers
 _____ Number other farm(s) controlled by farmer
 _____ Number all farms controlled by farmer

43. How many of the gona (fields) were planted with g'corn last year (1976/77)?

- _____ Number gandu farms planted with guinea corn
 _____ Number gayauna farms planted with guinea corn
 _____ Number other farms planted with guinea corn
 _____ Number all farms planted with guinea corn.

44. How would you compare the total size of your gona (fields) with the total size of the gona (fields) of the average pot in the village?

- _____ Less than average
 _____ Average
 _____ More than average

45. (a) Approximately how many days would it take one man to ridge by hand each of the gona (fields) on which you grew guinea corn last year?

- _____ Days to ridge biggest g'corn field
 _____ Days to ridge second biggest g'corn field
 _____ Days to ridge all other g'corn fields
 _____ Total number of days to ridge all fields

(b) Approximately how many days would it take one man to ridge by hand all the fields which you had last year?

- _____ Days to ridge all gona (upland) fields
 _____ Days to ridge all fadama (seasonally flooded) fields

46. Did you plant g'corn in sole or mixed stands last year?

- _____ All field(s) intercropped (proceed to question 47 if all field(s) were mixed cropped)
 _____ All fields sole cropped. (skip to question 49 if all field(s) were sole cropped).

- _____ Some fields intercropped; some sole cropped (proceed to question 47 if some fields were mixed cropped and others sole cropped)
47. Please list the crops planted in mixed stands in the various fields last year.
- Biggest field _____
- Second biggest field _____
- Smallest field _____
48. Explain the main reason why you planted guinea corn mixed with other crops rather than in sole stands.
- _____ Because it is our traditional way of growing crops
- _____ Because it gives higher output
- _____ Because of shortage of land
- _____ More efficient use of labor
- _____ It is the best way to grow crops
- _____ Other (specify) _____
49. Please list any crops which you planted in sole stand last year.
- _____
- _____
50. Explain the primary reason why you planted the fields in sole stands rather than in mixed stands.
- _____ In order to obtain higher yields
- _____ Because the extension worker advised it
- _____ Because I had land
- _____ It requires less labor
- _____ It is the best way to grow the crop(s)
- _____ Other (specify) _____
51. From what source did you learn the best time to plant guinea corn?
- _____ My father
- _____ Someone else in pot
- _____ Other person in compound but outside pot
- _____ Relative/friend outside compound
- _____ Extension agent (demonstration plot)
- _____ Cooperative society
- _____ Radio
- _____ Newspaper
- _____ No particular source (not certain)
- _____ Other (specify) _____
52. From what source did you obtain the guinea corn seed which you planted last year?
- _____ Local market
- _____ Cooperative society
- _____ Extension worker

- ☐ Self
☐ Other person in pot
☐ Other person in compound but outside pot
☐ Relative/friend outside compound
☐ Farmer from some other village. Approximate
 distance of village
 _____ Miles

53. Did you plant local or improved variety of guinea corn last year?

- ☐ Local variety
☐ Improved variety. If improved variety, what is the name of the variety? _____
 (If improved, skip to question 57).

54. Explain the primary reason why you did not plant improved seed last year?

- ☐ Seed not available
☐ Don't know where to obtain seed
☐ Never heard of improved seed
☐ Seed too expensive (had no money)
☐ Yield not dependable
☐ Not convinced improved seed is better than local
☐ Not our tradition to use such seed
☐ Not sure I will be able to sell it in local market
☐ Other (specify) _____

55. Suppose the main problem you have just mentioned can be overcome this year, would you be willing to plant improved seed next year?

- ☐ No
☐ Yes. (If yes, skip to question 57).
☐ Maybe. (not sure, probably yes, probably no)

56. If your answer to question 55 was "no" explain why you would still be unwilling to plant improved seed.

57. From what source did you learn to plant improved guinea corn variety? (Tick first mentioned source; skip this question, if farmer has not planted improved seed).

- ☐ Trader
☐ Cooperative society
☐ Someone in pot
☐ Other person in compound but outside pot
☐ Relative/friend outside compound
☐ Extension worker
☐ Radio
☐ Newspaper
☐ No one in particular (not certain)
☐ Other (specify) _____

58. How did the yield of the improved seed compare to the local variety?
- ☐ Less than average
☐ Average
☐ More than average
59. Did you treat your seed guinea corn with seed dressing chemical before planting last year?
- ☐ No. If no, skip to question 63.
☐ Yes.
60. From what source did you learn to use seed dressing chemical?
- ☐ Extension worker (demonstration plot)
☐ Cooperative society
☐ Trader
☐ Someone in pot
☐ Other person in compound but outside pot
☐ Relative/friend outside pot
☐ Radio
☐ Newspaper
☐ No one in particular (not certain)
☐ Other (specify) _____
61. How was the germination of the seeds treated with seed dressing chemical compared to the germination of seeds, that were not treated with seed dressing chemical?
- ☐ Less than average
☐ Average
☐ More than average
62. What is the name of the seed dressing chemical which you used?
- ☐ Traditional seed dressing
☐ Aldrex T
☐ Fernasan D
☐ Didigam
☐ Don't know (not certain)
☐ Other (specify) _____
63. Please explain the primary reason why you did not use seed dressing chemical last year. (Skip this question if farmer has used seed dressing chemical).
- ☐ Seed dressing not available.
☐ Never heard of seed dressing chemical.
☐ Don't know where to obtain the chemical.
☐ Too expensive (had no money).
☐ Not sure seed dressing chemical has real advantage.
☐ It might be harmful to human beings.
☐ Seed dressing chemical not dependable.

- ☐ Don't know how to use seed dressing chemical
☐ Other (specify) _____
64. If the main reason you have just mentioned can be overcome this year, would you be willing to use seed dressing chemical next year?
- ☐ No
☐ Yes. If yes, skip to question 66.
☐ Maybe (not sure, probably yes, probably no).
65. Why would you still be unwilling to use seed dressing chemical?
- _____
- _____
66. Last year, did you use the guinea corn spacing, recommended by the extension worker? (Recommended spacing: 2 feet apart on 3-foot ridges for tall varieties; 1 foot or 1½ feet apart on 3-foot ridges for dwarf varieties i.e. close spacing).
- ☐ No
☐ Yes. If yes, skip to question 70.
67. Please explain the primary reason why you did not use the recommended spacing. (Skip this question if farmer used close spacing).
- ☐ Spacing not suitable because I plant other crops with g'corn.
☐ It is not our traditional way of growing g'corn.
☐ It takes too much time to measure.
☐ I don't believe the spacing can really improve yield.
☐ Have never heard of the spacing.
☐ Have never been taught the type of spacing.
☐ Other (specify) _____
68. If the main reason you have just mentioned can be overcome this year would you be willing to adopt the new spacing next year?
- ☐ No
☐ Yes. If yes, skip to question 70.
☐ Maybe (not sure, probably yes, probably no).
69. If your answer to question 68 was "no" explain why you would still be unwilling to use the recommended spacing.
- _____
- _____

70. How was the yield of your guinea corn planted using the recommended spacing compared to the yield of the guinea corn planted using traditional spacing? (Skip this question if farmer has not used recommended spacing.)
- _____ Less than average
_____ Average
_____ More than average
71. Did you apply fertilizer to g'corn last year?
- _____ No. If no, skip to question 75.
_____ Yes
72. What type of fertilizer did you apply to guinea corn?
- _____ Compound (Kampa)
_____ Sulphate of ammonia (Salfa)
_____ Single (20%) super phosphate
_____ Urea
_____ Calcium nitrate
_____ Manure (taki)
_____ Other (specify) _____
73. What effect did the fertilizer or manure have on the guinea corn?
- _____ Increased the yield
_____ Had no effect
_____ Decreased the yield
_____ Other (specify) _____
74. From what source did you learn how to apply fertilizer to g'corn?
- _____ Extension worker (demonstration plot)
_____ Cooperative society
_____ Someone in pot
_____ Other person in compound but outside pot
_____ Relative/friend outside compound
_____ Radio
_____ Newspaper
_____ No particular source (not certain)
_____ Other (specify) _____
75. Please explain the primary reason why you did not apply fertilizer to guinea corn last year. (Skip this question if he applied fertilizer to guinea corn last year.)
- _____ Fertilizer not available
_____ Didn't know where to buy fertilizer
_____ Too expensive (had no money)
_____ Didn't think fertilizer could really increase yield of guinea corn
_____ Fertilizer increases weed problems

_____ Didn't know how to use fertilizer
 _____ Other (specify) _____

76. Suppose the problem you have mentioned can be overcome this year, would you be willing to apply fertilizer to g'corn next year?

_____ No
 _____ Yes. If yes, skip to question 78.
 _____ Maybe, (not sure, probably yes, probably no)

77. Please explain why you would still be unwilling to apply fertilizer to guinea corn.
- _____
- _____

78. Did you apply storage insecticide to guinea corn stored in rumbu or granary last year?

_____ No. If no, skip to question 80.
 _____ Yes.

79. From what source did you learn to use the storage insecticide? (Skip this question if farmer did not use storage insecticide.)

_____ Extension worker
 _____ Cooperative society
 _____ Trader
 _____ Someone in pot
 _____ Other person in compound but outside pot
 _____ Relative/friend outside compound
 _____ Radio
 _____ Newspaper
 _____ No particular source (not certain)
 _____ Other (specify) _____

80. Please explain the primary reason why you did not use storage insecticide last year. (Skip this question if farmer used storage insecticide.)

_____ Storage insecticide not available
 _____ Don't know where to buy storage insecticide
 _____ Have never heard of storage insecticide
 _____ Too expensive (had no money)
 _____ Don't believe insecticide can give good protection against storage pests.
 _____ Storage insecticide might be harmful to human beings
 _____ Don't know how to use it
 _____ Not the traditional way to store g'corn
 _____ Other (specify) _____

81. Suppose the problem you have just mentioned can be overcome this year, would you be willing to apply storage insecticide to guinea corn next year?

☐ No
☐ Yes (If yes, skip to question 83).
☐ Maybe (not sure, probably yes, probably no)

82. Please explain why you would still be unwilling to use storage insecticide.

83. When we started this interview, I asked you the number of persons that work regularly on your farm(s). Did you have sufficient labor last year?

☐ No
☐ Yes. If yes, skip to question 85.

84. Explain the main aspect of guinea corn production that suffered as a result of labor shortage.

☐ Land preparation
☐ Timely planting
☐ Weeding
☐ Fertilizer application
☐ Timely harvesting
☐ None
☐ Other (specify) _____

85. Which system of guinea corn production requires more labor use, the traditional or the modern system using improved practices?

☐ Traditional. If traditional, skip to question 87.
☐ Improved.
☐ Don't know (not certain)
☐ Have not used improved practices for guinea corn production.

86. How did you solve the labor problems caused by improved practices?

☐ Used family labor only
☐ Used family and hired labor
☐ Other (specify) _____
☐ Have not used improved practices for guinea corn production.

87. Did you use the tractor hire service last year?

☐ No
☐ Yes. If yes, skip to question 89.

88. Explain the primary reason why you did not use the tractor hire service.
- ☐ Not available
 - ☐ Not aware of tractor hire service
 - ☐ Aware but don't know where to hire tractor
 - ☐ Too expensive (had no money)
 - ☐ Farm not accessible to tractor
 - ☐ Applied but could not get tractor
 - ☐ Other (specify) _____
89. Did you use ox-plow (work animals) last year?
- ☐ No
 - ☐ Yes. If yes, skip to question 91.
90. Explain the primary reason why you did not use ox-plow.
- ☐ Had no oxen and necessary attachments
 - ☐ Too expensive (had no money)
 - ☐ Don't know how to plow with oxen
 - ☐ Not our traditional way of farming
 - ☐ Other (specify) _____
91. Did you obtain any credit last year for your farm enterprise?
- ☐ No. If no, skip to question 95.
 - ☐ Yes
92. Which farm(s) did you spend the credit on?
- ☐ None of the farms
 - ☐ Farm(s) planted to g'corn only
 - ☐ Farm(s) planted to another or other crops but not g'corn
 - ☐ All farms
93. What item did you spend most of the credit on?
- ☐ Hiring labor
 - ☐ Buying seed
 - ☐ Fertilizer
 - ☐ Farm tools and equipment
 - ☐ Tractor hire
 - ☐ Family needs
 - ☐ Other (specify) _____
94. What was your main source of credit last year?
- ☐ Family member
 - ☐ Local money lender
 - ☐ Cooperative society
 - ☐ Thrift society
 - ☐ Bank
 - ☐ Other (specify) _____

95. Please tell me the primary reason why you did not obtain any credit for your farm work (skip this question if he obtained credit for farm work last year).

☐ Credit not available
☐ Interest rate too high
☐ I don't want to be in debt
☐ According to our custom, it is not good to be in debt
☐ Other (specify) _____

96. When did you sell most of your guinea corn last year?

☐ None sold. If none sold, skip to question 98.
☐ 1-2 months after harvest. Price sold/bundle _____ or/
 bag _____ Total amt. sold _____
☐ 3-4 months after harvest. Price sold/bundle _____ or/
 bag _____ Total amt. sold _____
☐ 5-6 months after harvest. Price sold/bundle _____ or/
 bag _____ Total amt. sold _____
☐ 7 months and over. Price sold/bundle _____ or bag/_____
 Total amt. sold _____
☐ At harvest. Price sold/bundle _____ or/bag _____
 Total amt. sold _____
☐ Before harvest (i.e. standing g'corn). Total amt.
 sold. _____

97. How was the price at which you sold guinea corn last year compared to the previous year? (Skip this question if none sold.)

☐ Less than average
☐ Average
☐ More than average

98. Did you produce all the guinea corn needed to feed persons eating from your pot last year?

☐ No
☐ Yes. If yes, skip to question 100.

99. How did you provide the extra guinea corn needed to feed all the persons eating from your pot last year?

☐ Obtained guinea corn as gift.
☐ Obtained guinea corn as a loan.
☐ Bought guinea corn. If bought, price/bundle _____ or/
 bag _____ Total amt. spent _____
☐ Other (specify) _____

100. If the current price of guinea corn received by farmers goes up by half, how would it influence your farming decision next year? (Tick first decision mentioned).

☐ Will try to increase production by increasing land now devoted to guinea corn.

- ☐ Will try to increase production by using fertilizer and other improved practices.
- ☐ Will try to increase production from existing land by using more labor to weed and carry out other cultural practices more satisfactorily.
- ☐ Will not alter present production plans.
- ☐ Don't know what to do at this time.
- ☐ I do not produce guinea corn for sale.
- ☐ Other (specify) _____

101. If the current price of guinea corn received by farmers falls by half how would it influence your farming decision next year? (Tick first decision mentioned).

- ☐ Will not increase production.
- ☐ Will not use fertilizer and other improved practices.
- ☐ Will not alter present production plans.
- ☐ Will not use hired labor.
- ☐ Will switch some of the land now under g'corn to some other crop.
- ☐ Will hire labor, if need arises.
- ☐ Don't know what to do at this time.
- ☐ I do not produce guinea corn for sale.
- ☐ Other (specify) _____

102. During this interview we have discussed the major practices which can improve the yield of guinea corn. List any improved practices which you once adopted as recommended by the extension worker and which you no longer use.

- ☐ None
- ☐ Improved seed
- ☐ Time of planting
- ☐ Seed dressing chemical
- ☐ Seed rate
- ☐ Fertilizer
- ☐ Weed control
- ☐ Spacing
- ☐ Storage insecticide
- ☐ Monocropping (growing one crop at a time on a farm)
- ☐ Thinning
- ☐ Other (specify) _____

103. Explain the primary reason why you discontinued the use of the improved practice(s) which you have just mentioned (question 102).

- Improved seed _____
- Time of planting _____
- Seed dressing _____
- Seed rate _____

Fertilizer_____

Weed control_____

Spacing_____

Storage insecticide_____

Monocropping_____

Thinning_____

Other practice(s) (specify) _____

104. This is the last and a most important question. What do you think should be done to encourage farmers to adopt new farming ideas?

Thank you for your cooperation and good luck in your farming enterprise. This is the end of the interview.

Name of Person
Making Interview_____

Date of Interview_____

MOTIVATIONAL FACTORS RELATED TO THE ADOPTION
OF IMPROVED PRACTICES

GENERAL QUESTIONNAIRE*

1. Name of:
village _____
District _____
Division _____
River Project or Scheme _____
2. Is there a motor road to this village ?
_____ No
_____ Yes. If yes, can motor vehicles travel to the
village all year-round?
_____ No
_____ Yes
3. Is there a market in this village?
_____ No
_____ Yes. If yes, skip to Question 5.
4. How many miles is the nearest market where foodstuff can
be bought or sold?
_____ Miles
5. Is there a cooperative society of which any person from
this village is a member?
_____ No
_____ Yes
6. Is there a cooperative shop in this village?
_____ No
_____ Yes
7. Is there a hospital, dispensary or health center in this
village?
_____ No
_____ Yes
8. Is there a school in this village? (Tick appropriate
answer.)
_____ Primary school
_____ Post-primary school
_____ Primary and post primary schools
_____ None
9. Is there any television set in this village?
_____ No
_____ Yes. If yes, approximately how many television sets
are there in the village?
_____ Number

*One copy of the general questionnaire should be completed by the enumerator in respect of each village from which he interviews farmers. The information required can be obtained from the village head or any other authoritative source in the village.

10. Are there some radio sets in this village?
 _____ No
 _____ Yes. If yes, approximately how many radio sets are
 in the village?
 _____ Number
11. Is there any extension agent located in this village?
 _____ No
 _____ Yes. If yes, when was the first extension worker
 assigned to the village?
 _____ Years (Skip to Q. 13 if the village has an
 extension worker.)
12. If there is no extension agent located in this village,
 does any extension agent visit this village on regular
 basis from any other village to advise the farmers on how
 to improve crop production?
 _____ No
 _____ Yes
13. Does this village have an extension council or committee?
 _____ No
 _____ Yes
14. Is there a Young Farmers' Club in this village?
 _____ No
 _____ Yes
15. Is fertilizer sold in this village?
 _____ No
 _____ Yes. If yes, skip to Q. 18.
16. If fertilizer is not sold in this village, how many
 miles is the nearest village or town where fertilizer can
 be bought?
 _____ Miles
17. Is improved seed sold in this village?
 _____ No
 _____ Yes. If yes, skip to Q. 19.
18. How many miles is the nearest village or town where
 improved seed can be bought?
 _____ Miles
19. How many adult males reside in this village?
 _____ Heads of pots
 _____ Heads of compounds
 _____ Unmarried adult males 15 years old and above
 _____ Taxable adult males

This is the end of this interview. Thank you for your coopera-
 tion.

Name of Person Conducting Interview _____
 Name of Village Head or Person Interviewed _____
 Date of Interview _____

APPENDIX III

TO THE FARMERINTRODUCTION

I want to explain to you the purpose of this interview. This interview is a part of the survey which we are conducting in Kano State in order to find out the reasons why farmers accept or reject the new farming ideas suggested to them by agricultural extension workers. The primary purpose is to find out what can be done to encourage farmers to adopt new farming ideas.

Toward this objective, we are asking a representative sample of farmers a number of simple questions. You may be wondering how we selected you. First, we obtained the list of names of all the farmers in a representative number of villages and then randomly picked a few to interview. You are one of those few farmers we have selected in this way. Approximately one hundred and eighty farmers in Kano State may be interviewed.

By cooperating in this interview, you are helping us to find solutions to the problems facing our farmers. You are also rendering an important service to your community. I want to assure you that this survey has absolutely nothing to do with tax assessment. It is only concerned with finding out farm problems, and how to solve them. The information being collected is strictly for the purpose of agricultural improvement.

The interview will concentrate on guinea corn which is a very important food crop. I would like to proceed with the interview.

MOTIVATIONAL FACTORS RELATED TO THE ADOPTION OF IMPROVED
FARM PRACTICES: A STUDY OF THE SORGHUM PROGRAM OF THE KANO
STATE PILOT PHASE OF THE NIGERIAN ACCELERATED
FOOD PRODUCTION PROJECT

by

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The primary objective of the study was to determine those factors that motivate farmers to adopt improved agricultural technology. A problem implied as a hinderance to the modernization of Nigerian agriculture is the reluctance of farmers to adopt recommended practices. Three null hypotheses were formulated: (1) there is no relationship between the characteristics of farmers and the adoption of recommended practices; (2) there is no relationship between extension agent/farmer contact and the adoption of recommended practices; and (3) the field programs being used by the National Accelerated Food Production Project (NAFPP) have not influenced farmers to adopt recommended practices.

An instrument was designed to assess "why" subjects did or did not adopt certain recommended practices. The instrument was administered in late 1977 to 138 subjects randomly selected from 16 villages in 6 districts in Kano State of Nigeria. This included 28 NAFPP participants.

Several variables thought to be associated with the adoption of recommended sorghum production practices were analyzed to test the hypothesis of independence of farmer characteristics and adoption behavior. The characteristics that showed significant relationship to practice adoption were literacy in Roman/Arabic script, social status and size of family. Those showing no relationship were age and farming experience. Of the economic factors, seasonality in off-farm occupation and use of credit showed significant relationship, while family labor force and ox-plow use showed no

relationship. The conclusion which can be drawn from the data is that certain characteristics of the respondents supported the hypothesis while others did not.

Several measures of extension agent/farmer contact were assessed to test the hypothesis of independence of the variable and practice adoption. A highly significant relationship was observed between the frequency of extension agent farm visits and the adoption of recommended practices. Significant differences were also observed in the adoption behavior of those respondents who sought extension agent advice and those who did not. The data appears to suggest that the personality orientation of farmers influences their adoption behavior. Adoption behavior of those respondents who had participated in or had exposure to the mini-kit and production kit plots compared to those who had not, revealed significant differences. The null hypotheses concerning the effectiveness of agent/farmer contact and NAFPP field programs were rejected.

Several conclusions were drawn from the study: (1) small scale farmers in Kano State are responsive to improved technologies; (2) the motivation of small scale farmers to adopt improved technologies is presently constrained by lack of production and technological inputs and inadequate extension contact; (3) farmers in Kano State generally perceive improved practices as yield increasing innovations; (4) intercropping is preferred by the farmers to monocropping mainly because of the higher output obtainable from the former and because it is a strategy against risks and uncertainties; (5) extension

contact is an important determinant of adoption behavior; (6) the NAFPP mini-kit and production kit programs are effective in inducing change, as is the extension demonstration plot ; (7) literacy in Roman and/or Arabic script positively influences the adoption of recommended practices; (8) the farmers who operate larger farms are more likely to adopt innovations than those with smaller farms; (9) gandu households tend to be larger, have larger size farms, and numerically stronger labor force with members holding more off-farm occupations year-round than iyali households; (10) size of family influences adoption behavior; (11) the incidence of discontinuance of innovations in Kano State is not common; (12) many farmers in Kano State are facing labor problems; and (13) the relative advantage of an innovation over a traditional practice influences the adoption behavior of farmers.

Further studies are suggested to: (1) assess the influence of village socio-economic variables in the modernization of agricultural practices; (2) determine the rate of adoption of improved practices and predict possible "snowball effect" of the NAFPP; (3) develop strategies for the communication of improved practices more appropriate to local needs; and (4) appraise the effectiveness and relevance of the on going mini-kit program to the farming system.